

# COINAGE ACT OF 1965

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## HEARINGS BEFORE THE COMMITTEE ON BANKING AND CURRENCY HOUSE OF REPRESENTATIVES EIGHTY-NINTH CONGRESS

FIRST SESSION

ON

### H.R. 8746

(Superseded by H.R. 8926)

A BILL TO PROVIDE FOR THE COINAGE OF THE UNITED STATES

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JUNE 4, 7, AND 8, 1965

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Printed for the use of the Committee on Banking and Currency





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# COINAGE ACT OF 1965

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FRIDAY, JUNE 4, 1965

HOUSE OF REPRESENTATIVES,  
COMMITTEE ON BANKING AND CURRENCY,  
Washington, D.C.

The committee met, pursuant to notice, at 10 a.m., in room 2128, Rayburn House Office Building, Hon. Wright Patman (chairman) presiding.

Present: Representatives Patman, Ashley, Moorhead, Stephens, Weltner, Hanna, White, Gettys, Todd, Cabell, Hansen, Widnall, Mrs. Dwyer, Harvey, Brock, Stanton, and Mize.

The CHAIRMAN. The committee will please come to order.

Today the committee considers H.R. 8746, a bill providing for the coinage needs of the United States.

(H.R. 8746 and the President's message follow:)

[H.R. 8746, 89th Cong., 1st sess.]

A BILL To provide for the coinage of the United States

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as "The Coinage Act of 1965".*

## TITLE I

SECTION 1. (a) The Secretary of the Treasury is authorized to cause to be minted and issued the following coins:

(1) A half dollar or 50-cent piece which shall be composed of an alloy of eight hundred parts of silver and two hundred parts of copper per each one thousand parts by weight clad on a core of a silver-copper alloy of such fineness that the composition of each coin shall be four hundred parts of silver and six hundred parts of copper out of each one thousand parts by weight.

(2) A quarter dollar or 25-cent piece and a dime or 10-cent piece each of which shall be composed of an alloy of 75 per centum of copper and 25 per centum of nickel clad on a core of pure copper.

(b) The cladding alloy used for the outside layers of such coins shall comprise not less than 30 per centum of the weight of each coin. Such coins shall be of the same diameter, respectively, as the coins of the United States of corresponding denominations current at the time of enactment of this Act.

(c) The weight of the half dollar provided for herein shall be eleven and fifty one-hundredths grams, of the quarter dollar five and sixty-seven one-hundredths grams, and of the dime two and two hundred and sixty-eight one-thousandths grams.

SEC. 2. Subject to the requirements of section 1, the methods of manufacture of the coins therein provided, the wastage allowances, and the allowable deviations in the metallic percentages and weights, shall be as determined by the Secretary of the Treasury. Such coins shall be subject to the laws pertaining to the designs and inscriptions on coins of the United States.

SEC. 3. All coins minted pursuant to the provisions of this Act shall be legal tender for all debts, public and private, public charges, taxes, duties, and dues.

SEC. 4. Nothing herein contained shall be deemed to prohibit the continued minting of coins of the United States authorized by law at the time of enactment of this Act.

SEC. 5. Whenever in the judgment of the Secretary of the Treasury such action is necessary to protect the coinage of the United States, he is authorized under such rules and regulations as he may prescribe to prohibit the exportation, melting, or treating of coins of the United States.

SEC. 6. The Secretary of the Treasury is authorized to sell on such terms and conditions as he may deem appropriate, at not less than the monetary value thereof, any silver of the United States in excess of that required to be held as reserves against silver certificates.

SEC. 7. The Secretary of the Treasury is authorized and directed to purchase at the price of \$1.25 per fine troy ounce silver mined after the date of enactment of this Act from natural deposits in the United States or any place subject to the jurisdiction thereof and tendered to a United States mint or assay office within one year after the month in which the ore from which it is derived was mined. The bullion fund provided by section 3526 of the Revised Statutes, as amended (31 U.S.C. 335), may be used for such purchases.

SEC. 8. In order to expedite acquisition of essential equipment, patents, patent rights, technical knowledge and assistance, metallic strip, and other materials necessary to assure the prompt and continued availability of materials required to produce an adequate supply of the coins provided for herein, the Secretary of the Treasury, during such period as he may deem necessary, is authorized, without regard to the provisions of section 3528 of the Revised Statutes, as amended (31 U.S.C. 340), or any other law, to enter into contracts upon such terms and conditions as he may deem appropriate and in the public interest, for the acquisition or transportation of such equipment, patents, patent rights, technical knowledge and assistance, metallic strip, or other materials.

SEC. 9. (a) The Act of September 3, 1964, Public Law 88-580, is amended to read as follows: "Notwithstanding section 3517 of the Revised Statutes (31 U.S.C. 324), all coins minted from the date of enactment of this Act shall be inscribed with the year of the coinage or issuance unless in the judgment of the Secretary of the Treasury such inscription is likely to contribute to a shortage of coins, in which case the particular coins involved may be inscribed with the last preceding year whose date has been inscribed on coins of the same denominations."

(b) Section 3550 of the Revised Statutes (31 U.S.C. 366) is repealed.

SEC. 10. The first sentence of section 3558 of the Revised Statutes, as amended (31 U.S.C. 283), is amended to read as follows: "The business of the United States assay office in San Francisco shall be in all respects similar to that of the assay office of New York except that until such time as the Secretary of the Treasury determines that the mints of the United States are adequate for the production of ample supplies of coins, its facilities may be used for the production of any coins of the United States authorized by law."

SEC. 11. Section 4 of the Act of August 20, 1963 (31 U.S.C. 294), is amended by striking out "\$30,000,000" and inserting in lieu thereof "\$45,000,000."

SEC. 12. Section 3 of the Act of December 18, 1942 (31 U.S.C. 317c), is amended by striking out "minor" each place it appears in such section. Section 9 of the Act of March 14, 1900 (31 U.S.C. 320), is hereby repealed.

SEC. 13. Section 3528 of the Revised Statutes, as amended (31 U.S.C. 340), is amended (1) by striking out "this Act," in the first sentence and inserting in lieu thereof "law,"; (2) by striking out "minor" each place it appears in such section; and (3) by striking out "\$3,000,000" and inserting in lieu thereof "\$30,000,000."

SEC. 14. Section 485 of the Act of June 25, 1948 (18 U.S.C. 485), is amended by striking out "the gold or silver coins" and inserting in lieu thereof "gold, silver, silver-clad, or cupronickel-clad coins."

SEC. 15. The Secretary of the Treasury is authorized to issue such regulations as he may deem necessary to carry out the provisions of this Act.

SEC. 16. Whoever knowingly violates any of the provisions of section 5 hereof or of any order, rule, regulation or license issued pursuant thereto shall, upon conviction, be fined not more than \$10,000 or imprisoned not more than five years, or both. In addition, there shall be forfeited to the United States any coins exported, melted, or treated in violation of this Act of any order, rule, regulation of license issued hereunder, or any metal resulting from such melting or treating of coins. Such coins or metal may be seized and condemned by like proceedings as those provided by law for the forfeiture, seizure or condemnation of property imported into the United States contrary to law.



## TITLE II

SECTION 1. The President is hereby authorized to establish a Joint Commission on the Coinage to be composed of the Secretary of the Treasury as Chairman; the Secretary of Commerce; the Director of the Bureau of the Budget; the Director of the Mint; the chairman and ranking minority member of the Senate Banking and Currency Committee; the chairman and ranking minority member of the House Banking and Currency Committee; one Member of the House of Representatives to be appointed by the Speaker; one Member of the Senate to be appointed by the President of the Senate; and four public members to be appointed by the President, none of whom shall be associated or identified with or representative of any industry, group, business, or association directly interested as such in the composition, characteristics, or production of the coinage of the United States.

SEC. 2. No public official or Member of Congress serving as a member of the Joint Commission shall continue to serve as such after he has ceased to hold the office by virtue of which he became a member of the Joint Commission. Any vacancy on the Joint Commission shall be filled by the choosing of a successor member in the same manner as his predecessor.

SEC. 3. The Joint Commission shall study the progress made in the implementation of the coinage program established by this Act, and shall review from time to time such matters as the needs of the economy for coins, the standards for the coinage, technological developments in metallurgy and coin-selector devices, the availability of various metals, renewed minting of the silver dollar, the time when and circumstances under which the United States should cease to maintain the price of silver, and other considerations relevant to the maintenance of an adequate and stable coinage system. It shall, from time to time, give its advice and recommendations with respect to these matters to the President, the Secretary of the Treasury, and the Congress.

SEC. 4. There are authorized to be appropriated to remain available until expended, such amounts as may be necessary to carry out the purposes of this title.

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[H. Doc. 199, 89th Cong., 1st sess.]

MESSAGE FROM THE PRESIDENT OF THE UNITED STATES RELATIVE TO SILVER  
COINAGE

*To the Congress of the United States:*

From the early days of our independence the United States has used a system of coinage fully equal in quantity and quality to all the tasks imposed upon it by the Nation's commerce.

We are today using one of the few existing silver coinages in the world. Our coins, in fact, are little changed from those first established by the Mint Act of 1792. For 173 years, we have maintained a system of abundant coins that with the exception of pennies and nickels is nearly pure silver.

The long tradition of our silver coinage is one of the many marks of the extraordinary stability of our political and economic system.

Continuity, however, is not the only characteristic of a great nation's coinage. *We should not hesitate to change our coinage to meet new and growing needs. I am, therefore, proposing certain changes in our coinage system—changes dictated by need—which will help Americans to carry out their daily transactions in the most efficient way possible.*

There has been for some years a worldwide shortage of silver. The United States is not exempt from that shortage—and we will not be exempt as it worsens. *Silver is becoming too scarce for continued large-scale use in coins.* To maintain unchanged our high silver coinage in the face of this stark reality would only invite a chronic and growing scarcity of coins.

We expect to use more than 300 million troy ounces—over 10,000 tons—of silver for our coinage this year. *That is far more than total new production of silver expected in the entire free world this year.* Although we have a large stock of silver on hand we cannot continue indefinitely to make coins of a high silver content—in the required quantity—in the face of such an imbalance in the production of silver and the demand for it.

We must take steps to maintain an adequate supply of coins, or face chaos in the myriad transactions of our daily life—from using pay telephones to parking in a metered zone to providing our children with money for lunch at school.



*The legislation I am sending to the Congress with this message will insure a stable and dignified coinage, fully adequate in quantity and in its specially designed technical characteristics to the needs of our 20th century life. It can be maintained indefinitely, however much the demand for coin may grow.*

Much as we all would prefer to retain the silver coins now in use, there is no practical alternative to a new coinage based on materials in adequate supply.

#### THE NEW COINAGE

I propose no change in either the penny or the nickel.

The new dime and the quarter—while remaining the same size and design as the present dime and quarter—will be composite coins. They will have faces of the same copper-nickel alloy used in our present 5-cent piece, bonded to a core of pure copper. The new dime and quarter will, therefore, outwardly resemble the nickel, except in size and design, but with the further distinction that their copper core will give them a copper edge.

This type of coin was selected because, alone among practical alternatives, it can be used together with our existing silver coins in the millions of coin-operated devices that Americans now depend upon heavily for many kinds of food and other goods.

#### THE HALF DOLLAR

Our new half dollar will be nearly indistinguishable in appearance from the present half dollar.

It will continue to be made of silver and copper, but the silver content will be reduced from 90 to 40 percent. It will be faced with an alloy of 80 percent silver and 20 percent copper, bonded to a core of 21 percent silver and 79 percent copper. The new half dollar will continue to be minted with the image of President Kennedy. Its size will be unchanged.

#### THE SILVER DOLLAR

No change in this famous old coin, or plans for additional production, are proposed at this time. It is possible that implementation of the new coinage legislation that I am proposing, greatly reducing the requirement for silver in our subsidiary coinage, will actually make feasible the minting of additional silver dollars in the future. Certainly, without this change in the silver content of the subsidiary coinage, further minting of the silver dollar would be forever foreclosed.

It is our intention that the new coinage circulate side by side with our existing coinage. We plan to continue the minting of our current silver coins while the new coinage is brought into quantity production.

The new coins will be placed in circulation some time in 1966.

In terms of the present pattern of coin usage, adoption of the new coinage will permit a saving of some 90 percent of the silver we are now putting into coins annually.

*I want to make it absolutely clear that these changes in our coinage will have no effect on the purchasing power of our coins.* The new ones will be exchanged at full face value for the paper currency of the United States. They will be accepted by the Treasury and by the Federal Reserve banks for any of the financial obligations of the United States. The legislation I am proposing expressly recognizes the new coins as legal tender.

It is of primary importance, of course, that our new coins be specifically designed to serve our modern, technological society. In the early days of the Republic, silver coins served well because the value of a coin could only be measured by the value of the precious metal contained in it. For many decades now the value of a particular coin has depended not on the value of the metal in it, but on the face value of the coin. Today's coinage must primarily be utilitarian. The new coinage will meet this requirement fully, while dispensing with the idea that it contain precious metal.

It is, above all, practical. It has been specifically designed to function, without causing delays or disruptions of service, in coin-operated merchandising machines.

Furthermore, it is composed of materials low enough in value and readily enough available to insure that we can have as many coins as we need.

The legislation I am proposing also contains these additional recommendations:

## OTHER AUTHORITY REQUESTED

*First.*—As a useful precautionary measure, I request standby authority to institute controls over the melting and export of coins to assist the protection of our existing and our new silver coinage.

*Second.*—I request authority to purchase domestically mined silver at not less than \$1.25 per ounce.

*Third.*—I am asking for authority to reactivate minting operations temporarily at the San Francisco Assay Office.

*Fourth.*—As a safeguard for assured availability of the new coinage, I am asking for new contracting authority for the procurement of materials and facilities related to it.

*Fifth.*—I propose the establishment of a Joint Commission on the Coinage, composed of certain Members of the Congress, the public, and the executive branch of the Government, to report to me later the progress made in the installation of the new coinage and to review any new technological developments and to suggest any further modifications which may be needed.

## WHY THE SILVER CONTENT OF THE COINAGE MUST BE REDUCED AT THIS SESSION

These recommendations for revision of our silver coinage rest upon extensive study of the silver situation, and of alternatives to our present coinage, by both governmental and private specialists. The Treasury Department's comprehensive report, known as the Treasury Staff Silver and Coinage Study, is being released today as background to my recommendations. Its principal finding *was that the supply of silver in the free world has become progressively incompatible with the maintenance of silver in all our subsidiary coins.*

On the average, in the 5 years from 1949 through 1953, new silver production in the free world amounted to about 175 million troy ounces per year, while consumption amounted to more than 235 million ounces. There was an average deficit in those 5 postwar years of more than 60 million ounces of silver per year.

In the latest completed 5 years, 1960 through 1964, free world consumption of silver has averaged 410 million ounces annually, but new production has averaged a little less than 210 million ounces a year. The result has been an average annual deficit of about 200 million ounces. That is three times the average annual deficit in the 5 years from 1949 through 1953.

If no silver at all had been used for coinage there would have been a deficit in new production in free world silver during the last 5 years averaging over 40 million troy ounces, or some 1,370 tons, a year.

The gap between the production of silver and silver consumption is continuing to increase. In 1964 the silver production deficit swelled to over 300 million ounces—half again the 1963 figure. And in 1964, the use of silver in coinage, and the use of silver for the arts and industry of the free world were each—taken separately—greater than new production.

*There is no dependable or likely prospect that new, economically workable sources of silver may be found that could appreciably narrow the gap between silver supply and demand.* The optimistic outlook is for an increase in production of about 20 percent over the next 4 years. This would be of little help. Further, because silver is produced chiefly as a byproduct of the mining of copper, lead, and zinc, even a very large increase in the price of silver would not stimulate silver production sufficiently to change the outlook.

Short of controls that are undesirable in a peacetime free society, there is no way to diminish the bounding growth of private demand for silver for use in jewelry, silverware, photographic film, and industrial processes. The one part of the demand for silver that can be reduced is governmental demand for use in coinage.

Most free world countries no longer use silver in their coins. A few—as we now propose—continue to make limited use of it. It is true that U.S. coinage does not currently depend upon new silver production, because for many years we have supplied silver for our coinage out of large Treasury stocks, which still amount to 1 billion troy ounces.

*But—and this is the crux of the matter—at the present pace, this stock cannot last even as much as 3 years. We would then be shorn of our ability to maintain the coinage, and, if there were no alternative to our present silver coinage, the Nation would be faced with a chronic coin shortage. That is why definitive action is necessary at this session of the Congress.*



## PROTECTION OF THE COINAGE

It is necessary for the U.S. Government to have large stocks of silver in addition to the quantity needed for coinage.

We need these stocks because our silver coins in circulation must be protected from hoarding or destruction. Protection of the silver coinage will continue to be a necessity since we plan for it to continue to circulate alongside the new coins. Our silver coins are protected by the fact that the Government stands ready to sell silver bullion from its stocks at \$1.29 a troy ounce. This keeps the price of silver, as a commodity, from rising above the face value of our coins. This, in turn, makes hoarding or melting of the silver coinage unprofitable.

*It is as additional protection for the existing coinage that I am requesting standby authority to institute controls over the melting, treating, or export of U.S. coins.*

It may be asked why we seek standby control authority since we retain a large stock of silver with which to protect our silver coins through operations in the silver market.

The answer is clear. Given the magnitudes by which demand for silver is outrunning new production, we must consider the possibility, however unlikely, that the silver stock we possess could itself require the support and protection that would be afforded by authority to forbid melting and export of our coins.

We believe our present stocks of silver to be adequate, once the large present drains from coinage are greatly reduced, to meet any foreseeable requirements for an indefinite period. *However, prompt action on a new coinage will help us protect the silver coinage by freeing our silver reserves for redemption of silver certificates at \$1.29 per ounce. Thus, we can assure that no incentive will be created for hoarding our present coins in anticipation of a higher price for their silver content.*

There is the opposite, although in all likelihood short-run, possibility that a fall in the price of silver might result from the enactment of this legislation largely removing silver from our subsidiary coin. *It is for the purpose of protecting silver producers from a precipitate drop in the price of silver resulting from the action of the Government that I am requesting authority for the Secretary of the Treasury to purchase any newly mined domestic silver offered to him, at the price of \$1.25 per troy ounce.*

## THE SAN FRANCISCO ASSAY OFFICE

Coinage operations at the San Francisco Mint were ended in 1955. Legislation converting the mint to the San Francisco Assay Office was passed in 1962. As part of our efforts to overcome the coin shortage of the past year, coin blanks have been cut and annealed at the San Francisco Assay Office. Present law forbids full minting there. However, we will temporarily need the facilities of this plant to move into large quantity production of the new coinage and to continue production of existing coins until enough new small money is made to make certain we have adequate supplies. *Consequently, I am asking for authority to reactivate minting operations at San Francisco on a temporary basis.*

A new, fully modern mint is to be built in Philadelphia. However, it cannot be completed and in operation before late 1967. It is our expectation that when the new Philadelphia Mint's capacity is added to that of the Denver Mint, our coinage requirements can be met efficiently and economically. Consequently, no more than temporary authority to mint coins in San Francisco is recommended in the draft legislation I am sending to you.

## WHY COMPOSITE COINS ARE RECOMMENDED

We have no choice but to eliminate silver, for the most part, from our subsidiary coinage. The question was: What would be the best alternative? After very thorough consideration of all aspects of this highly complex problem, we have settled upon the two types of composite, or clad, coins I have already described. These are 10- and 25-cent pieces with cupronickel alloy faces bonded to a solid copper core, and a new half dollar with outer and inner layers of differing silver-copper alloys.

This type of coin was found to be necessary if the new coinage is to be compatible with the existing silver coinage in all the 12 million coin-operated devices in use in the United States.

The convenience of using coins in automatic merchandising and service devices is a fact that, like the coins in our pockets and in our store tills, we take for granted. But if our coinage were suddenly to be such that it would not work in coin-operated devices, the public would be subjected to very great inconvenience and serious losses would occur to business with harmful effects upon employment.

The automatic merchandising industry is a large and growing part of our national economy. Last year, \$3½ billion worth of consumer items were sold through 3½ million of these machines. On more than 30 billion separate occasions a consumer made a purchase by putting a coin in a machine. In growing numbers, factories, hospitals, and other places now depend upon automatic vending for the service of goods. A million and a half people now rely upon coin-controlled vending for at least one meal a day. The use of coin-operated devices is expanding rapidly, not only in merchandise vending, but also in a number of other services.

Six million of our coin-operated devices, including nearly all vending machines, have selectors set to reject coins or imitations of coins that do not have the electrical properties of our existing silver money. Highly selective rejectors are a necessity in these machines if they are to be a low-cost source of food and other goods and services. Otherwise, fraudulent use would soon make them costly.

The sensors in these machines are set to accept or reject coins on the basis of the electrical properties of our traditional coins, which have a high proportion of silver. To be compatible in operation with our existing coinage, therefore, our new coins must duplicate the electric properties of a coin that is 90-percent silver. No single acceptable metal or alloy does so. The composite coins, made of layers of differing metals and alloys, that I am asking the Congress to approve, are coins made to order to duplicate the electrical properties of coins with a high silver content. They are the only practical alternatives we have discovered to our present coinage.

Selectors exist that can handle coins with the widely varying electrical properties of, say, nearly pure silver and nearly pure nickel. But that is not enough. When the selectors are set to accept coins with greatly differing electrical properties, the selectivity of the mechanism declines and they will accept wrong coins and imitations. Unless the coins in use have very similar electrical properties, the coin-operated machines become subject to a high degree of fraudulent use. This would be costly to all concerned.

The future may bring selectors of a different kind able to accept coins of widely varying electrical properties while at the same time rejecting imitations and wrong coins. They are not available now. When and if they become available, our new coinage will work in them. On the other hand, if we now chose an incompatible coinage, there would be delays and interruptions lasting a year to 3 years in the services of these machines. This would impose heavy inconveniences upon the public and would cause business and employment losses in a large and growing industry.

In view of these considerations of public interest, we have concluded that our new coinage must without fail be able to carry out the technical merchandising functions of a modern coinage, working alongside our existing silver coinage. *The new coins that I am recommending to you do this, and do it well, because they were specifically designed for the task.*

The new half dollar was designed with the strong desire in mind of many Americans to retain some silver in our everyday coinage. We believe that by eliminating silver from use in the dime and the quarter, we will have enough silver to carry out market operations in protection of our existing silver coinage—and to make a half dollar of 40 percent silver content. It is clear and unmistakable that we would not have enough silver to extend this to the dime and quarter: they are heavily used, indispensable coins that we must have at all times in large quantity. We are convinced that we can include a 40-percent silver half dollar in the new coinage, but we cannot safely go beyond that. As a precaution, we intend to concentrate at first on getting out large quantities of the new quarter and dime before we embark upon quantity production of the new half dollar.

#### THE JOINT COMMISSION ON THE COINAGE

We believe the recommendations being made for a new coinage are sound and durable and in the best public interest. However, the installation of a new coinage is a matter so intimately affecting the life of every citizen, and so delicately related to the Nation's commerce, that it is impossible to be certain in advance that all problems have been foreseen, even by such a long and arduous process of research as has gone into the selection of the proposed new coins.

Consequently, I am including among my recommendations the proposal for a Joint Commission on the Coinage. It will be composed of the four officers of the executive branch most directly concerned with matters affected by the coinage—the Secretary of the Treasury, the Secretary of Commerce, the Director of the



Budget Bureau and the Director of the Mint; of four members representing the public interest, to be appointed by the President; of the chairmen and ranking members of the Banking and Currency Committees of the House and the Senate; of one Member each from the two Houses of the Congress, to be appointed by the Vice President and the Speaker of the House. The Commission will be appointed soon after the new coinage is issued. It will study such matters as new technological developments, the supply of various metals, and the future of the silver dollar. It will report as to the time and circumstances in which the Government should cease to maintain the price of silver. It will be directed to advise the President, the Congress, and the Secretary of the Treasury on the results of its studies.

#### THE COINAGE—CURRENT AND PROSPECTIVE

I am pleased to report to the Congress substantial progress toward overcoming the coin shortage the Nation has been experiencing. Greatly increased minting has eliminated the shortage of pennies and of nickels. We are still somewhat on the short side of the demand for dimes and quarters, but this deficit is rapidly being overtaken. A severe shortage of the half dollar continues, due to the popularity of the new 50-cent pieces bearing the image of President Kennedy.

I want to emphasize that we will continue to make the existing coins while the new ones come into full production, and that we contemplate side-by-side circulation of the old and new coins for the indefinite future. *There is no reason for hoarding the silver coinage we now use, because there is no reason for it to disappear.*

We are gearing up for maximum production of the new coins as soon as they are authorized by the Congress. Supply of the materials for them is assured. Both copper and nickel are economical and available in North America. Their usage in coins will not add enough to overall employment of these metals to create supply or price problems.

In the first year after new coins are authorized, we expect to make 3½ billion pieces of the new subsidiary coins. That is a billion and a half more pieces than will be made of the corresponding silver coins in the current fiscal year.

In the second year after authorization of the new coinage, we expect to be able to double the first year's output of the new coins, reaching a production total of 7 billion pieces.

We expect in this way to avoid any new coin shortage in the transition to production of the new coins, and within a period of less than 3 years to reach a point at which we could, if necessary, meet total coinage needs out of production of the new coins.

*I am satisfied, that taking into account all of the various factors involved in this complex problem, the recommendations that I am making to you are sound and right. Your early and favorable action upon the proposed legislation will make it possible to produce and issue to the public a coinage that will be acceptable, provide the maximum convenience, and serve all the purposes—financial and technical—of modern commerce. In considering this problem the needs of the economy and the convenience of the public have been placed ahead of all other considerations. They are the factors that have resulted in my recommendations to the Congress. I urge their approval at the earliest possible date.*

THE WHITE HOUSE, June 3, 1965.

LYNDON B. JOHNSON.

#### DRAFT OF ADMINISTRATION BILL

A BILL To provide for the coinage of the United States

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as "The Coinage Act of 1965."*

#### TITLE I

SECTION 1. (a) The Secretary of the Treasury is authorized to cause to be minted and issued the following coins:

(1) A half dollar or fifty-cent piece which shall be composed of an alloy of 800 parts of silver and 200 parts of copper per each one thousand parts by weight clad on a core of a silver-copper alloy of such fineness that the composition of each coin shall be 400 parts of silver and 600 parts of copper out of each 1000 parts by weight.

(2) A quarter dollar or twenty-five-cent piece and a dime or ten-cent piece each of which shall be composed of an alloy of 75 percent of copper and 25 percent of nickel clad on a core of pure copper.

(b) The cladding alloy used for the outside layers of such coins shall comprise not less than thirty percent of the weight of each coin. Such coins shall be of the same diameter, respectively, as the coins of the United States of corresponding denominations current at the time of enactment of this Act.

(c) The weight of the half dollar provided for herein shall be 11.50 grams, of the quarter dollar 5.67 grams and of the dime 2.268 grams.

SEC. 2. Subject to the requirements of section 1, the methods of manufacture of the coins therein provided, the wastage allowances, and the allowable deviations in the metallic percentages and weights, shall be as determined by the Secretary of the Treasury. Such coins shall be subject to the laws pertaining to the designs and inscriptions on coins of the United States.

SEC. 3. All coins minted pursuant to the provisions of this Act shall be legal tender for all debts, public and private, public charges, taxes, duties and dues.

SEC. 4. Nothing herein contained shall be deemed to prohibit the continued minting of coins of the United States authorized by law at the time of enactment of this Act.

SEC. 5. Whenever in the judgment of the Secretary of the Treasury such action is necessary to protect the coinage of the United States, he is authorized under such rules and regulations as he may prescribe to prohibit the exportation, melting or treating of coins of the United States.

SEC. 6. The Secretary of the Treasury is authorized to sell on such terms and conditions as he may deem appropriate, at not less than the monetary value thereof, any silver of the United States in excess of that required to be held as reserves against silver certificates.

SEC. 7. The Secretary of the Treasury is authorized and directed to purchase at the price of \$1.25 per fine troy ounce silver mined after the date of enactment of this Act from natural deposits in the United States or any place subject to the jurisdiction thereof and tendered to a United States mint or assay office within one year after the month in which the ore from which it is derived was mined. The bullion fund provided by section 3526 of the Revised Statutes, as amended (31 U.S.C. 335), may be used for such purchases.

SEC. 8. In order to expedite acquisition of essential equipment, patents, patent rights, technical knowledge and assistance, metallic strip and other materials necessary to assure the prompt and continued availability of materials required to produce an adequate supply of the coins provided for herein, the Secretary of the Treasury, during such period as he may deem necessary, is authorized, without regard to the provisions of section 3528 of the Revised Statutes, as amended (31 U.S.C. 340), or any other law, to enter into contracts upon such terms and conditions as he may deem appropriate and in the public interest, for the acquisition or transportation of such equipment, patents, patent rights, technical knowledge and assistance, metallic strip, or other materials.

SEC. 9. (a) The Act of September 3, 1964, Public Law 88-580, is amended to read as follows:

“Notwithstanding section 3517 of the Revised Statutes (31 U.S.C. 324), all coins minted from the date of enactment of this Act shall be inscribed with the year of the coinage or issuance unless in the judgment of the Secretary of the Treasury such inscription is likely to contribute to a shortage of coins, in which case the particular coins involved may be inscribed with the last preceding year whose date has been inscribed on coins of the same denominations.”

(b) Section 3550 of the Revised Statutes (31 U.S.C. 366) is repealed.

SEC. 10. The first sentence of section 3558 of the Revised Statutes, as amended (31 U.S.C. 283), is amended to read as follows:

“The business of the United States assay office in San Francisco shall be in all respects similar to that of the assay office of New York except that until such time as the Secretary of the Treasury determines that the mints of the United States are adequate for the production of ample supplies of coins, its facilities may be used for the production of any coins of the United States authorized by law.”

SEC. 11. Section 4 of the Act of August 20, 1963 (31 U.S.C. 294), is amended by striking out “\$30,000,000” and inserting in lieu thereof “\$45,000,000”.

SEC. 12. Section 3 of the Act of December 18, 1942 (31 U.S.C. 317c), is amended by striking out “minor” each place it appears in such section. Section 9 of the Act of March 14, 1900 (31 U.S.C. 320), is hereby repealed.

SEC. 13. Section 3528 of the Revised Statutes, as amended (31 U.S.C. 340), is amended (1) by striking out “this Act,” in the first sentence and inserting in lieu thereof “law,”; (2) by striking out “minor” each place it appears in such section; and (3) by striking out “\$3,000,000” and inserting in lieu thereof “\$30,000,000”.



SEC. 14. Section 485 of the Act of June 25, 1948 (18 U.S.C. 485), is amended by striking out "the gold or silver coins" and inserting in lieu thereof "gold, silver, silver-clad, or cupronickel-clad coins".

SEC. 15. The Secretary of the Treasury is authorized to issue such regulations as he may deem necessary to carry out the provisions of this Act.

SEC. 16. Whoever knowingly violates any of the provisions of section 5 hereof or of any order, rule, regulation, or license issued pursuant thereto shall, upon conviction, be fined not more than \$10,000 or imprisoned not more than five years, or both. In addition, there shall be forfeited to the United States any coins exported, melted, or treated in violation of this Act or any order, rule, regulation or license issued hereunder, or any metal resulting from such melting or treating of coins. Such coins or metal may be seized and condemned by like proceedings as those provided by law for the forfeiture, seizure, or condemnation of property imported into the United States contrary to law.

## TITLE II

SECTION 1. The President is hereby authorized to establish a Joint Commission on the Coinage to be composed of the Secretary of the Treasury as Chairman; the Secretary of Commerce; the Director of the Bureau of the Budget; the Director of the Mint; the chairman and ranking minority member of the Senate Banking and Currency Committee; the chairman and ranking minority member of the House Banking and Currency Committee; one Member of the House of Representatives to be appointed by the Speaker; one Member of the Senate to be appointed by the President of the Senate; and four public members to be appointed by the President, none of whom shall be associated or identified with or representative of any industry, group, business, or association directly interested as such in the composition, characteristics, or production of the coinage of the United States.

SEC. 2. No public official or Member of Congress serving as a member of the Joint Commission shall continue to serve as such after he has ceased to hold the office by virtue of which he became a member of the Joint Commission. Any vacancy on the Joint Commission shall be filled by the choosing of a successor member in the same manner as his predecessor.

SEC. 3. The Joint Commission shall study the progress made in the implementation of the coinage program established by this Act, and shall review from time to time such matters as the needs of the economy for coins, the standards for the coinage, technological developments in metallurgy and coin-selector devices, the availability of various metals, renewed minting of the silver dollar, the time when and circumstances under which the United States should cease to maintain the price of silver, and other considerations relevant to the maintenance of an adequate and stable coinage system. It shall, from time to time, give its advice and recommendations with respect to these matters to the President, the Secretary of the Treasury, and the Congress.

SEC. 4. There are authorized to be appropriated, to remain available until expended, such amounts as may be necessary to carry out the purposes of this title.

## SECTION-BY-SECTION ANALYSIS OF THE BILL

### *Title I*

Section 1 authorizes the minting and issuance of a new series of coins in denominations of 10, 25, and 50 cents which will be manufactured from composite metals containing three layers. In the case of the 50-cent piece, the outside or cladding layers would be composed of an alloy of 80 percent silver and 20 percent copper and the core of a silver-copper alloy of such fineness that the overall composition of each coin would be 40 percent silver and 60 percent copper. The 10- and 25-cent coins would consist of cupronickel (75 percent copper, 25 percent nickel) clad on a core of pure copper. Section 1 also prescribes the proportionate amounts of core and cladding alloys in the coins, the weight of each coin and that such coins are to be of the same diameter as the current coins of the United States of corresponding denominations.

Section 2 authorizes the Secretary of the Treasury to determine the methods of manufacture of the new coins, the wastage allowances, and the allowable deviations in the metallic percentages and weights. It provides also that such coins shall be subject to existing laws pertaining to the designs and inscriptions on U.S. coins.

Section 3 provides that the coins shall be legal tender. While existing statutes governing legal tender are broad enough to cover the new coins, an express provision in the new bill is deemed desirable to eliminate any possible doubt.



Section 4 provides continuing authority for the coinage of coins authorized by provisions of existing law. This will enable the continued production of present coinage to the extent necessary to assure the production of ample supplies of coins during the period of transition to the new coinage.

Section 5 gives standby authority to the Secretary of the Treasury to prohibit the exportation, melting, or treating of U.S. coins when necessary to protect the coinage.

Section 6 provides for sales by the Treasury of silver in excess of that required to be held against silver certificates at prices not less than the monetary value. This will clarify the authority of the Treasury to make sales of such excess silver under appropriate conditions.

Section 7 authorizes the purchase of newly mined domestic silver by the Treasury at the price of \$1.25 per fine troy ounce. This will protect silver-producing industries against any precipitate drop in the price of their product which might result from the change in U.S. coinage alloy. Silver purchased under this provision can be used in coinage at values not less than \$1.29 plus per fine troy ounce. Section 7 also authorizes the use of the bullion fund for the purchase of silver.

Section 8 authorizes the Secretary, for as long as he deems it necessary, to procure, on terms deemed appropriate and in the public interest, any materials, technical knowledge and assistance, equipment, patents, transportation services, etc., necessary to assure prompt and continued availability of materials required for the new coinage without regard to any laws requiring advertising and competitive bidding or imposing other restrictions on the negotiation of contracts for the purchase of property by the Government.

Section 9 directs that coins minted after enactment of this act shall bear the year of the coinage or issuance unless the Secretary of the Treasury determines that this is likely to contribute to a coin shortage. In this event, the particular coins involved may be inscribed with the last preceding year whose date appeared on coins of these denominations. This section would also repeal an obsolete provision of law requiring that the obverse working dies at each mint be destroyed at the end of each year.

Section 10 authorizes use of the San Francisco Assay Office for coinage on a temporary basis until such time as the Secretary of the Treasury determines that the facilities at the mints are adequate for the production of ample supplies of coins. It is anticipated that during the period of transition to the new coinage the mints' production load will be particularly heavy and additional facilities will be needed. Use of the San Francisco Assay Office is the most expeditious way of providing these. Section 10 also authorizes permanent use of the San Francisco Assay Office for refining gold and silver bullion. This will also contribute to the efficiency of operations at the mints and assay offices.

Section 11 increases the maximum amount authorized to be appropriated for the construction of the new mint at Philadelphia from \$30 million to \$45 million. Additional funds will be necessary to provide equipment and facilities for the new coinage.

Section 12 will authorize and provide financing for the melting of any worn and uncurrent U.S. coins, including the new cupronickel-clad and silver-clad coins, received in the Treasury and the sale or recoinage of the resulting metals. The section also repeals an act which requires recoinage of all worn and uncurrent subsidiary silver coins received in the Treasury.

Section 13 authorizes use of the minor-coinage metal fund and the minor-coinage profit fund (to be renamed the coinage-metal fund and the coinage-profit fund) for the purchase of metals for the coins provided for in the act and for certain expenses incurred in such coinage; namely, the wastage and cost of distribution of the coins. It also raises the amount available in the coinage-metal fund from \$3 million to \$30 million. This increase in amount is necessary because after enactment of the bill this fund will be used for the purchase of metals used in coinage of all denominations whereas at the present time it is used only for metals for 1- and 5-cent coins.

Section 14 amends one of the counterfeiting laws so as to make it applicable to the new cupronickel and silver-clad coins on the same terms and conditions as it is now applicable to the subsidiary silver coins. It is not necessary to amend any of the other counterfeiting laws since these will be applicable by their terms to the new coins.

Section 15 is a general provision authorizing the Secretary of the Treasury to issue regulations that may be necessary to carry out the provisions of the act.

Section 16 provides penalties for violations of any regulations issued under section 5 of the act, prohibiting the export, melting, or treating of U.S. coins.

The penalties would be forfeiture and imprisonment up to 5 years or a fine up to \$10,000, or both.

### *Title II*

Section 1 provides for the establishment of a Joint Commission on the Coinage, composed of four executive officials, six Members of Congress, and four public members to be appointed by the President. The public members shall not be representatives of any group having a direct interest in coinage.

Section 2 provides that the executive and congressional members shall cease to serve on the Joint Commission after leaving their public office, and provides for the filling of vacancies on the Commission.

Section 3 provides that the Joint Commission shall study the progress made in the implementation of the coinage program established by the act. It shall review and give its advice and recommendations from time to time to the Congress, President, and the Secretary of the Treasury on such matters as the needs of the economy for coins, the standards for the coinage, technological development in metallurgy, the availability of various metals, renewed minting of the silver dollar, the time when and circumstances under which the United States should cease to maintain the price of silver, and other considerations relevant to the maintenance of an adequate and stable coinage system.

Section 4 authorizes the appropriation of such amounts as may be necessary for the expense of the Joint Commission.

The CHAIRMAN. The Congress and the American people have known for some time that legislation would be proposed to solve the several complex problems relating to our coin situation. This problem has been the subject of study by the U.S. Treasury for the past 2 years. The legislation before us today calling for changes in our coinage will, if enacted, provide the needed coins of all denominations to oil the wheels of commerce and trade.

Under this legislation, industries such as defense, jewelry, film, and others, which use substantial quantities of silver, will be assured of continued availability of this useful metal. The vending machine industry, which today constitutes an important element in our economy employing many people, will be assured that coins, both the new ones as proposed and, of course, the existing coins will be operative in existing coin-operated devices.

Also, the silver-mining industry, both its owners and the miners that provide us with silver, will, under this legislation, be encouraged to expand exploration and research and development activities to produce the greatest amount of this increasingly scarce mineral.

And, finally, the public, under this legislation, will need have no fear whatsoever of the value of these new coins; for, regardless of the metal used in making our coinage, the full faith and credit of the United States stands behind them all.

We are opening our hearings with the Honorable Henry Fowler, making his first appearance before our committee since his appointment as Secretary of the Treasury.

Secretary Fowler, over the years, has appeared frequently before this committee during the distinguished career he has achieved in a number of top posts in Government, particularly as Defense Mobilizer during the Korean war, and as Under Secretary of the Treasury in the early days of the Kennedy administration.

We are pleased to have Mr. Fowler make his first appearance before us as Secretary on a matter of such importance to the United States as the composition of the coinage.

Secretary Fowler is accompanied by Assistant Secretary Robert A. Wallace, who also has contributed much to the proposal now under consideration and who also is a distinguished public servant.



We are glad to have you gentlemen with us today.

Mr. Secretary, if you will identify yourself for the record, and also those accompanying you, it would be appreciated, and you may proceed in your own way.

**STATEMENT OF HON. HENRY H. FOWLER, SECRETARY OF THE TREASURY; ACCOMPANIED BY ROBERT A. WALLACE, ASSISTANT SECRETARY; FRED B. SMITH, ACTING GENERAL COUNSEL; FREDERICK W. TATE, DEPUTY DIRECTOR OF THE MINT; AND JOHN H. AUTEN, DEPUTY DIRECTOR, OFFICE OF FINANCIAL ANALYSIS**

Secretary FOWLER. Thank you, Mr. Chairman.

My name is Henry H. Fowler, I am Secretary of the Treasury.

On my left is Assistant Secretary of the Treasury Robert Wallace; Mr. Frederick Tate, who is the Deputy Director of the mint on his left; Mr. Fred Smith, the Acting General Counsel for the Treasury Department on his left; and on my right, Mr. John Auten, Deputy Director of the Office of Financial Analysis of the Treasury Department.

Thank you, Mr. Chairman, for this opportunity to appear before your committee today in support of the legislation the President has recommended for a new and efficient U.S. coinage.

We particularly appreciate the promptness with which this hearing has been called following the submission of the President's message, because time is an important element in the matter with which we have to deal.

We are recommending a change in the coinage because there is not enough available silver to assure the continued minting of our traditional 90-percent silver coins for the years ahead in the quantities necessary to meet our rapidly increasing coinage requirements.

As much as all of us would prefer to keep our old and handsome silver coinage, there is no choice but to reduce drastically our heavy dependence upon silver for this purpose for one simple reason: the demand for silver has far outrun supply.

The only option open to us in this matter, without gravely risking the national interest in adequate and plentiful coinage, has been choice of what new material to use in the place of silver.

The new coinage the President has recommended that you authorize has all the attributes of a strong and stable coin system, and that, moreover, it is fully modern, and specifically engineered to carry out efficiently all the tasks that American merchandising of our day requires.

The new coins recommended to you will provide uninterrupted service as a medium of exchange. They can be made without the necessity of further change for a long period ahead. These coins are made of materials for which there is assured access. They can be minted without undue difficulty and at moderate cost. They can be used across the counter—and in all of the 12 million coin-operated devices in use in the United States—side by side with our existing silver coins.

There is, of course, no substitute for the appearance of silver. In one of the three new coins we are asking authority to make—the

half dollar—the beauty of the “noble metal” is preserved intact, although the actual silver content is much reduced. The proposed new dime and quarter are a departure from the tradition of silver, but they are coins that have a distinctively modern appearance and that will serve us well because they can protect us from future coin shortages. The fact that they are not silver, but are composite coins made of a nickel alloy bonded to a copper core, is a change that requires getting used to. But I think the ruddy edge resulting from their copper core gives these coins a character we will come not only to accept, but to value.

Now, for a few comments as to the underlying need for this legislation, which is simply the shrinkage of silver supplies.

In the statement there is a table attached which presents the silver supply situation as briefly and succinctly as possible. I have taken it from our “Treasury Staff Study of Silver and Coinage,” which I understand is or will be made available to the members of the committee.

(The table referred to follows:)

*Estimated free world silver consumption and production, 1949-64*

[Millions of fine troy ounces]

Calendar year	Industry and the arts	Use—Coinage demand			Total consumption	New production	Gross deficit	Deficit, excluding U.S. coinage demand
		United States	Foreign free world	Total				
1949-53, averages ----	153	36	48	85	238	174	64	28
1953-57, averages ----	190	37	36	74	264	191	73	36
1957-61, averages ----	216	47	51	98	314	200	114	67
1962 -----	248	77	50	128	375	207	169	72
1963 -----	252	112	56	167	419	214	205	93
1964 -----	286	203	62	265	550	216	335	132

NOTE.—A troy ounce equals 480 grains, an avoirdupois pound equals 7,000 grains, a 2,000-pound ton equals 14,000,000 grains; hence, 1,000,000,000 troy ounces (480,000,000,000 grains) equals 34,285 tons.

Source: “Treasury Staff Study of Silver and Coinage,” pt. III, table 1, figures rounded.

Secretary FOWLER. The table shows a steadily worsening of our silver supplies, from a small deficiency of production in the early postwar years to a slightly bigger deficiency in the next 5-year period, a much larger inadequacy in the 5 years from 1957 through 1961, and to a bounding growth of the deficiency in the last 2 calendar years. Actual market deficits are smaller than the difference between total consumption and new production because the United States meets its coinage needs for silver out of its stocks. These, however, are being depleted at a rate which cannot be permitted to continue indefinitely.

It is notable that in 1964 each major type of usage—the use of silver by industry and the arts, and use of silver for coinage—taken separately, was greater than new supply.

This is the crux of the matter.

There is simply not enough silver appearing on the market to continue to satisfy the demand for it in the foreseeable future.

There is no dependable—or, for that matter, likely—prospect, in the opinion of experts both inside and outside the Treasury, of new economically workable sources of silver that would appreciably narrow the gap between silver supply and demand. In fact, opti-



mistic projections envision an increase of no more than 20 percent over the next 4 years. Projected increases in consumption are at least equally as great.

This standoff between future increases of production and consumption in a situation where deficits are already very heavy could not change the basic conclusion that use of silver in our coinage must be very sharply curtailed. Also, because silver is produced chiefly as a byproduct of the mining of copper, lead, and zinc, even a very great increase in the price of silver would not stimulate new production sufficiently to change the situation.

Most free world countries have long since ended or nearly ended the use of silver in their coinage. Except for Canada and Switzerland, those countries still using silver coins make only limited use of it, in one or two "prestige" coins, as we now propose to do with the new half dollar. As seen in the table, in the early postwar years, the United States accounted for less than half of total free world employment of silver for coins, but at present we use more than three-quarters of all silver put into coins in the free world.

We have no choice but to make a large reduction of silver in the coinage, and no choice but to do so now. We have on hand some 1 billion ounces of silver in the Treasury stock. At current rates of mint production we are using silver for coinage at the rate of 300 million ounces a year; and for the redemption of silver certificates at 120 million ounces a year.

Even should demands upon our stock increase no more, it is clear that at present rates of use we can expect to exhaust our resources in 2 or 3 years. This gives us enough time to shift to a new coinage if we act promptly.

As to the basic requirement for the new coinage system—in arriving at our recommendations for new coinage alloys our overriding consideration, Mr. Chairman, was the necessity of continuing at all times to provide an adequate means of exchange and of avoiding any disruption of commerce. Experience shows all too clearly that, under modern conditions, the essential medium of exchange function is imperiled if a subsidiary coinage alloy threatens to become more valuable as a commodity than as money.

The Treasury's own staff study, and that of the Battelle Memorial Institute, establish certain other criteria which an acceptable coinage alloy should have, beyond the basic criterion of efficiency in its function as a medium of exchange. These include, the degree to which a coinage material lends itself to being minted into coins which would be durable in use; its acceptability to the public; ease and sureness of production; cost and availability of raw materials, and counterfeiting potential.

An additional criterion is a critical factor for a modern American coinage. Present-day coins should perform not only as a medium of exchange, but also as technical merchandising instruments, in use in coin-operated vending and service machines.

As to the need for compatibility of old and new coinage: The new coins should be made compatible with the existing coinage in use today in coin-operated devices, particularly in coin-operated vending machines. This is one of the most desirable characteristics of a modern coinage, and a characteristic fully met by the President's proposal. If the new coinage could not be used in these mechanisms,

the public would be subjected to great inconvenience, and trade and commerce in many sectors of distribution harassed and handicapped. If the new coins were not compatible, two alternatives would be presented, both of them undesirable from the point of view of the public at large:

(1) The vending machines would have to be shut down until new sensing and rejecting devices could be installed; or

(2) Their devices for sensing and rejecting wrong coins and slugs would have to be deliberately circumvented, exposing the machines to a high rate of fraud.

In the case of merchandise vending machines alone—that is, not including such service devices as pay telephones and coin-operated laundries—over \$3½ billion worth of goods were dispensed to consumers last year, in over 30 billion separate transactions.

These vending machines are equipped with sensitive selectors, which reject wrong coins, slugs, foreign coins, and the like. Highly selective rejectors are necessary if coin machines are to be low-cost supply points for foods and for many other kinds of goods, available by night and by day, in out-of-the-way as well as accessible places, such as the modern factory, which we have all observed.

Approximately half of the 12 million coin-operated machines in the United States are equipped with sensors that accept or reject coins on the basis of the electrical properties of our traditional high silver content coinage. To be compatible in operation with our existing coinage, our new coins must duplicate the electrical characteristics of a coin with high silver content. The coins we are recommending to you reproduce precisely the electrical properties of coins with high silver content. Moreover, they are made of the only materials that do so, satisfactorily, among the practical alternatives. Any other course would subject the public to extensive inconvenience.

If noncompatible materials are used, there will have to be an interregnum while new selectors are developed and brought into mass production that are—

(1) capable of handling coins of high silver content together with coins that do not have the electrical properties of nearly pure silver, and

(2) at the same time capable of rejecting slugs, low value foreign coins and coins of wrong denominations. Selectors exist that can handle coins with a wide range of electrical properties. But when they are set for a wide range, their selectivity falls, and they become subject to fraudulent use.

During the 1 to 3 years that development, manufacture and installation of a new kind of sensor would take, the public would not be able to use the incompatible new coinage in the 6 million of our coin-operated devices, chiefly those vending merchandise, fitted with sensitive selectors. The choice of the coins recommended here avoids these difficulties and the attendant interferences with trade and commerce.

Now, to outline briefly the recommendations that appear in the proposed legislation:

Section 1 of the proposed legislation describes the metallic content of the proposed new coinage:



## A. THE MINOR COINAGE

The penny and the 5-cent piece: No change is proposed.

## B. THE SUBSIDIARY COINAGE

1. The dime and the quarter: It is proposed that silver be eliminated from the dime and quarter. Instead, they should be composite, or clad, coins, faced with an alloy of 75 percent copper and 25 percent nickel—the same cupronickel alloy used throughout the 5-cent piece—bonded to a core of pure copper.

2. The half dollar: It is proposed that the 50-cent piece should also be a composite coin, with the silver content reduced from the present 90 percent to a new ratio of 40 percent. It would be faced with an alloy of 80 percent silver and 20 percent copper, clad on core alloy of approximately 21 percent silver and 79 percent copper.

3. The Silver Dollar: No change is proposed. Authority to make a silver dollar of the same weight and fineness—412.5 grains, 90 percent silver—made at various times since the act of 1837, would be continued. However, we would not plan to mint any new coins of this denomination at the present time.

Section 2 provides that the new coins would be subject to the current laws as to design and inscription.

With respect to these coins, I would like to emphasize the following points, some of them already discussed:

1. It is our intention that the existing silver coinage should circulate side by side with the new coinage, indefinitely.

2. The proposed new dime and quarter would have a copper-colored edge, due to the use of a pure copper core.

3. The new coinage would meet the exacting technical requirements necessary to permit it to be used in the coin-operated devices now in use in the United States, including those fitted with rejectors set to refuse coins or imitations of coins that do not have the electrical properties of our current silver coins.

4. We plan to place the new coins in circulation some time in 1966.

5. The new coins would be of the same size and design as present coins of the same denomination. They would be slightly lighter in weight.

Section 3 provides specific recognition of the new coins as legal tender.

Section 4 provides for continued minting of the existing coins as needed until production of the new coinage is adequate, continuing without change the standard silver dollar.

Section 5 provides for standby authority for the Secretary of the Treasury to prohibit the melting, exportation, or treating of U.S. silver coins.

Section 6 provides for sales by the Treasury of silver in excess of what is needed to back silver certificates, at a price not less than the monetary value of silver.

Section 7 would authorize the Treasury to purchase newly mined domestic silver at \$1.25 per fine troy ounce.

Section 8 provides for legal authority to procure the materials and technical assistance, equipment and patents needed to make the new coinage in the required quantity.



Section 9 provides authority to continue dating the new coins as of the first year they are issued.

Section 10 would authorize the temporary use of the San Francisco Assay Office for the minting of new coins, and would authorize the conversion of that facility for the refining of precious metals, if necessary, after it is no longer needed for coin production.

Sections 11 to 16: An act requiring recoinage of all worn and uncurrent subsidiary silver received in the Treasury is repealed; the minor-coinage metal fund is renamed the coinage-metal fund, and the minor-coinage profit fund is renamed the coinage-profit fund, and the amount available in the coinage-metal fund is raised from \$3 million to \$30 million; expenditure of not more than \$15 million is authorized for additional mint facilities to accommodate manufacturing requirements of the new materials; the counterfeiting laws are amended to cover the new coinage; the issuance of necessary regulations by the Secretary of the Treasury under the proposed act is authorized; and penalties are provided for violations of regulations issued under section 5.

A separate title of the proposed legislation of great significance provides for the establishment of a Joint Commission of the Coinage after the new coinage is issued.

The Commission would be composed of the Secretary of the Treasury, the Secretary of Commerce, the Director of the Bureau of the Budget, the Director of the Mint, of four public members, not representatives of interest groups, appointed by the President, of the chairmen and ranking minority members of the House and the Senate Banking and Currency Committees, and of two other congressional members, one appointed by the Speaker of the House and one by the President of the Senate.

The function of the Commission would be to study the progress of the implementation of the new coinage program, new technological developments that may intervene, the supply of various metals, and the future of the silver dollar. It would report as to the time and circumstances in which the Government should cease to maintain the price of silver, if that decision should seem desirable. And it would advise the President, the Congress, and the Secretary of the Treasury on the results of its studies.

As to the protection of existing coinage:

The continued use of coins that are 90 percent silver also requires protection of this high silver content coinage from hoarding or destruction.

There is no reason for hoarding of coins in anticipation of a coin shortage. We expect no such shortage during the period when we are installing the new coinage. We can, if necessary, step up production enough to replace completely, in less than 3 years, the entire body of existing silver coinage while at the same time keeping up with the normal growth of coin demand.

We can defend the existing silver coinage against the second possible danger—the threat of destruction by melting them for their silver content. To make certain that the silver coinage is not destroyed in this manner, it will be necessary for the Treasury to protect the monetary value of our silver coinage by supplying silver to the market upon demand at the present monetary price of silver of \$1.29 plus per troy ounce. The Treasury has been doing this since 1963 by exchanges of silver bullion against silver certificates.

The value of the silver in our existing coinage, as silver, would exceed the face value of the coins if the price were allowed to rise above a so-called melting point of these coins of \$1.38 per ounce. We hold the price of \$1.29 plus per ounce by standing ready freely to redeem silver certificates in silver at this price. The prudent course is to maintain the price of silver at its present level.

It is as additional protection for existing silver coinage, which includes the silver dollar, that we recommend asking for standby authority to institute controls over the melting, treating or export of U.S. coins, practices not now forbidden by law.

We believe strongly that suggestions for more extensive controls would operate against our best interests.

As to the sufficiency of coinage supply:

As you know, we have recently experienced a shortage of coins. I am happy to say that as a result of intensive production efforts on the part of the Mint the supply of coins in circulation and in inventory in the Federal Reserve banks is improved. There is no longer a shortage of the 1-cent and 5-cent pieces.

We still have a problem with dimes and quarters supply but substantial improvements have been made. The shortage of half dollars is still severe.

In view of the continuing shortages of high denomination coins and the uncertainties inevitable during the changeover period, we are gearing up for maximum production of the new coins as soon as the legislation is passed. In the first year after enactment, we expect to make at least 3½ billion of the new subsidiary coins—a billion and a half more than we will make of the silver coins in fiscal 1965. This is more than double the production in fiscal 1964 and four or five times what we would consider as a normal year's production of silver coins. In the second year after enactment we would expect to make well over 7 billion of the new coins, doubling production again.

As to the silver dollar:

The silver dollar will remain as an authorized coin of the United States, at 90 percent fineness. This is a central element in our program for holding the price of silver to its present level for the protection of our existing subsidiary silver coin. The future of the silver dollar can better be decided when the Joint Commission of the Coinage, which we have recommended, can take a look at the world's silver supply and demand situation and other relevant factors and make its recommendations. At that time, the facts can largely govern the decision on the issue of the future of the silver dollar.

Now, as to maintaining some silver in the subsidiary coinage:

We have considered it desirable to maintain some silver in our subsidiary coinage. It was to this end that the new silver half dollar was designed. The new composite coin reduced the silver content of the half dollar from 90 to 40 percent. It nevertheless retains without readily apparent differences, the aspect and ring of a coin with high silver content, although it is slightly lighter than the present half dollar. It is to be of the same design as the present half dollar, that is, bearing the image of the late President Kennedy.

One reason for retaining some silver in our coinage is a desire to continue the 173-year-old tradition of American silver coinage. Inclusion of a 40 percent silver half dollar is as far as we can safely go to satisfy this tradition. We expect that, barring unforeseen changes



in industrial demand for silver, we will have adequate silver to make this one coin in normal amounts for an indefinite period. After the new coins are in full production it should require no more than 15 million ounces a year—less than 5 percent of expected 1965 silver consumption for coins. One reason for continuing this particular coin is the fact that we could, if unforeseen difficulties developed, do without the half dollar temporarily. It can be replaced in use by two quarters.

In conclusion, a change in our coinage is unavoidable. We have reviewed very carefully the results of all of the studies which have been made on this subject. We are satisfied, that, taking into account all of the various factors involved in this problem, our recommendations for the new coinage are sound proposals that will, if enacted, provide the United States with a dependable, technically perfect, and distinctive coinage that can be produced in whatever quantity desired. It is a coinage that, I emphasize, "will perform not only across the counter, but will also carry out fully and without interruption its function as a technical merchandising instrument." This is absolutely necessary for the public interest. I, therefore, strongly urge approval of these recommendations and that they be enacted into law at the earliest possible date.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you, Mr. Secretary.

We are not asking for "souvenirs," but I wonder if you have any "samples" available that the members of the committee may inspect.

Secretary FOWLER. Yes; I think it would be appropriate to view them. Assistant Secretary Wallace has a display for that purpose.

The CHAIRMAN. All right, show them to the members, if you would, please, starting right here with Mr. Widnall.

It is not true, Mr. Secretary, that we would not debase our coinage at all by this bill because the monetary value attributed to silver is merely that accorded by the people's elected representatives?

Secretary FOWLER. That is correct, sir.

The CHAIRMAN. Isn't it really the full faith and credit of the United States that makes silver attractive to Americans?

Secretary FOWLER. That is correct.

The CHAIRMAN. In other words it is the dollar that supports silver and gold as well. What is really meaningful is official recognition as a medium of exchange by the Government, whether one speaks of paper, metal, or glass beads.

Now, legal tender is, of course, something that everyone must accept in payment of debts and taxes.

Secretary FOWLER. Yes, sir.

The CHAIRMAN. And related matters. So these coins, regardless of the commodity value of the metal that is in them, will have the stamp of the United States recognizing that each coin is legal tender for the payment of all debts, public and private.

Secretary FOWLER. Yes, sir.

The CHAIRMAN. What broader definition of "legal tender" is embraced—it has been a long time since I looked into it—besides debts and taxes? I know one fellow who owed a considerable amount as alimony, about \$1,500, and he took it all in pennies and delivered it to his former wife.

Secretary FOWLER. The provision would read as follows:  
Section 3, as proposed:

All coins minted pursuant to the provisions of this Act shall be legal tender for all debts, public and private, public charges, taxes, duties, and dues.

The CHAIRMAN. In other words, if they have something owing to them, they are compelled by law to accept these coins?

Secretary FOWLER. Correct.

The CHAIRMAN. Because these coins are legal tender.

Secretary FOWLER. Correct.

The CHAIRMAN. And that embraces not only taxes of the U.S. Government, income taxes and other different forms of taxes, but it includes debts of all kinds, public debts, private debts, including local taxes in the 3,072 counties, the States, the cities, and other political subdivisions.

Secretary FOWLER. Correct. I think it would be worth underscoring, in the light of your comments and questions, Mr. Chairman, that the President, in his message, mentioned the changes involved here will have no effect on the purchasing power of the coinage as we know it. The new ones will be exchanged at full face value for the paper currency of the United States. They will be accepted, in addition to the acceptance you have indicated, by the Treasury and the Federal Reserve banks for any of the financial obligations of the United States, and section 3 expressly recognizes the coins as legal tender.

We are aware, of course, that in the early days of the Republic, silver coins served well because the value of the coin at that time almost had to be measured by the content of the precious metal contained in it. But for many decades now, the value of the coin has depended on its face value and not on the value of the metal in it. We think that today the primary test of coinage must be primarily utilitarian. And indeed the difficulty that we are in today is that the value of the metal in our silver coins is so closely approaching their face value that, should it exceed that, the coinage would be no longer the medium of exchange that we want it to be.

The CHAIRMAN. The way I view it, when that situation is reached, at that time only is money a commodity.

Secretary FOWLER. That is right.

The CHAIRMAN. Money was spoken of as a commodity when, of course, we used gold and silver, and it was really a commodity. But now I do not think it is correct to say that money generally is a commodity, because it is not. Paper money is not a commodity—can't be.

Secretary FOWLER. Purely a medium of exchange.

The CHAIRMAN. So when the people decide through their elected representatives that the silver content of their coins be reduced, this in no way enhances the value of presently circulating coins or the silver that they contain.

For these reasons and other provisions in this bill, there is no point whatever in hoarding or melting the older coins by the public. There is nothing to be gained by this, and it will only cause another coin shortage. The new coins would be just as valuable in every way as our existing coinage, no more, no less.

Secretary FOWLER. Right, sir.



The CHAIRMAN. Mr. Ashley?

Mr. ASHLEY. Thank you, Mr. Chairman.

Mr. Secretary, you say that about 300 million ounces of silver is being used annually at the present time for the minting of coins. Is that correct?

Secretary FOWLER. Well, last year in the United States, in 1964, we used 203 million ounces, and this year—let's take the fiscal year 1965, that is just closing now—we will have used 268 million ounces for coinage purposes.

Mr. ASHLEY. Can you tell me how that breaks down in terms of dimes, quarters, half dollars?

Secretary FOWLER. By far the predominant usage of silver currently is in the dime and the 25-cent piece. For the fiscal year 1965, out of the total of 268 million ounces, we are using 73.8 million ounces for the 10-cent piece, 125 million ounces for the 25-cent piece, and 69.3 million ounces for the 50-cent piece.

Mr. ASHLEY. Thank you.

Now, how much for the 10-cent piece, again, sir?

Secretary FOWLER. 73.8 million ounces.

Mr. ASHLEY. Can you tell us or can it be supplied for the record the number of dimes, quarters, half dollars, and dollars that are presently in circulation?

Secretary FOWLER. The amount in circulation or the amount produced?

Mr. ASHLEY. The amount in circulation is what I would be interested in. I am interested in what is being introduced on an annual basis relative to the total supply in circulation.

Secretary FOWLER. By the end of this year, this calendar year, 1965, our estimate is that there will be in circulation 1,233 million 50-cent pieces.

Of the quarters, 3,317 million.

Of the dimes, 7,844 million.

Of the 5-cent pieces, 7,308 million.

Of the pennies, 40,645 million.

Total, if you are interested, Congressman Ashley, would be 60,347 million pieces of coins.

Mr. ASHLEY. In your statement, Mr. Secretary, you indicated——

Secretary FOWLER. I might qualify that in one respect. These are our estimates, and our estimates are based on an estimated 25-year life of coins.

Mr. ASHLEY. Thank you, sir.

In your statement you indicated a present world deficit, excluding U.S. coinage, of 132—this would be for 1964—132 million ounces.

Secretary FOWLER. That is right—excluding the U.S. coinage.

Mr. ASHLEY. Now, do we have a net deficit in this country in terms of our demand picture?

Secretary FOWLER. In terms of production?

Mr. ASHLEY. Of production versus supply.

Secretary FOWLER. Oh, yes. We are a very heavy importer. And also, Congressman Ashley, we must take into account the fact that today our needs in the United States are being met, not only out of domestic production—which is relatively not a very substantial factor—but out of imports and out of our own Treasury stocks.

Mr. ASHLEY. That is the thing that interests me, because our stocks are not limitless, by any manner of means.

Secretary FOWLER. They certainly are not. They are down now to roughly a billion ounces.

Mr. ASHLEY. So in 1964 if the deficit, excluding U.S. coinage demand, was 132 million ounces, what would be the U.S. deficit, excluding U.S. coinage demand that would have to be met from our stocks and from imports abroad?

Secretary FOWLER. That will take a little computation. But it is very easily obtained on an approximate basis.

If you include U.S. coinage, and U.S. industrial use, we had a gross deficit in 1964 of almost 300 million ounces in the United States.

Now, if you take out coinage, that deficit would be almost 100 million ounces.

Mr. ASHLEY. It is your feeling, I take it, it is your belief that this deficit would be met by imports from abroad without recourse to the Government's stock of silver?

Secretary FOWLER. No. I think there would have to be continual recourse to the Government stock of silver to meet this deficit.

Mr. ASHLEY. But if we have this limited stock, which indeed we do, of only a billion ounces or so, why do we then continue the production of half dollars with even 40 percent silver?

Secretary FOWLER. Because of the considerations that enter into maintaining at least one prestige coin as a part of our tradition, because the estimated silver use for a very adequate annual production rate of this coin would be only 15 million ounces, and because the ultimate solution of what I would call the industrial and arts problem of the use of silver is not going to be solved for the long-term indefinite future by whether we do or whether we don't utilize this 15 million ounces of silver a year for our own coinage.

Obviously, one of the problems that the proposed Joint Commission on Coinage will focus on—should it be authorized, when and if it is convened—will be the question of how long and under what circumstances the United States should continue in the silver business, so to speak. There will be an occasion, at that time, I think, for more careful and orderly review—away from the atmosphere of a coinage problem or of a coinage crisis—to consider the action most necessary in the light of the supply and demand situation as it exists at that time: Whether there are technological developments in which some of the industrial users of silver can find adequate substitute materials, whether reclaiming processes and whatnot that can be developed will avert any serious dislocation when and if for the U.S. Government to go out of the silver business. There are a whole range of problems, which it seemed to us would be untimely now for the Congress to try to resolve in connection with this current problem.

We wanted to focus for this legislation on the decisions that you and your colleagues would have to make regarding the coinage problem, and in a sense to defer until a more normal supply-demand situation—apart from the atmosphere of a coinage problem, when you might say the commercial and the industrial future of silver could be looked at in a somewhat separate context.

Mr. ASHLEY. Thank you, Mr. Secretary.

The CHAIRMAN. Mr. Widnall?

Mr. WIDNALL. Thank you, Mr. Chairman.

Good morning, Mr. Fowler.

I would like to say this at the outset, Mr. Chairman. I feel in view of the importance of this legislation, that members who received



very short notice for the meeting today and who were unable to attend should have an opportunity to question the Secretary of the Treasury. I would hope that he would be recalled at a date in the near future so that that opportunity could be afforded them. I think this applies to both sides of the aisle.

The CHAIRMAN. We will have Mr. Fowler back Monday. We discussed it with him, and he and Mr. Wallace can be with us on Monday, Mr. Widnall.

Mr. WIDNALL. Thank you, Mr. Chairman.

Mr. Fowler, in view of the fact that there is something in this bill for everybody, the users, the producers, the vending machine operators, and the like, couldn't this properly be characterized as a consensus coinage, which is a term you used in discussing it with the press yesterday?

Secretary FOWLER. I didn't coin that phrase, to use a pun, but it is a very acceptable one from my point of view, sir.

Mr. WIDNALL. When this bill goes into executive session, I am going to offer an amendment to flatly prohibit the coinage of silver dollars for a period of 5 years from the effective date of the act. The reason is to prevent any recurrence of the recent fiasco on the silver dollar coinage.

On May 15 there was a release from the White House with a statement by the President. This contained the following sentence:

Consequently, I have directed the mint to proceed with the making of silver dollars up to the amount authorized by the Congress during the remainder of the current fiscal year ending June 30.

To many of us it was absolutely incredible, in view of the continuing coin shortage, and the prospective action to revamp the silver coinage system.

On May 25, 1965, dispatches from wire services informed us the silver dollar coinage program was off. The first two paragraphs of the UPI dispatch stated:

The Treasury did an about-face yesterday and announced it will not mint any new silver dollars at this time.

The action with White House approval reverses President Johnson's order of May 15 for the minting of silver dollars.

I observe in passing that the executive department countermanding a Presidential order is an unusual procedure.

The next 3 to 5 years will be crucial and critical years in any revamping of our silver coinage system. My amendment would make certain in that critical period there would be no possibility of a silver dollar coinage fiasco such as we experienced only within the past month.

I would like to call your attention to a hearing before a subcommittee of the Appropriations Committee on May 24, 1965, where testimony was developed that trial runs had actually been made on the minting of the silver dollars authorized by the May 15 Presidential directive. And I quote from page 50 of that hearing:

Mr. CONTE. Will you, for the record, find out how many trial pieces have been minted?

Miss ADAMS. Surely.

The information that was requested follows, and I quote:

No silver dollars have been produced for delivery to the cashier as finished coins. A large number of pieces have been made as trial strikes. But in accordance with applicable mint regulations, these will be melted.



Mr. PASSMAN. They have been remelted already?  
Miss ADAMS. No.

I think that answer is rather evasive and unresponsive.

Mr. Chairman, I would like to have for the record before the close of these hearings the number of silver dollars minted in the trial run. I note in April 1965, the mint has a record that 339,685,000, 1-cent pieces were produced. It is inconceivable that they cannot come up with the number of silver dollars produced in the trial run.

And I also think it is important to know what date was placed on these silver dollars in the trial runs.

Now, have these trial run silver dollars yet been melted down?

Secretary FOWLER. Mr. Widnall, I would like to make several comments on your statement, and we will supply the information for the record and give you an answer to your question when that information is available—it should be readily available.

(The information referred to follows:)

A large number of silver dollar trial strikes were made at the Denver Mint. However, under established security control procedures, these trial strikes are accounted for on a weight basis, rather than a piece-count basis, and the trial strikes did not reach the final stage of being counted and bagged. All trial pieces have been melted as required by mint regulations.

From mint control records of the number of troy ounces of materials that were processed in the pressroom, it is estimated that approximately 316,076 pieces were processed. The dollar trial strikes were dated 1964.

Secretary FOWLER. I think that without rehashing the entire situation in detail, since it is behind us, I would only want to say that the committee should be also aware of the fact that in the Appropriations Act for the Treasury Department there was allotted \$600,000 for the purpose of making silver dollars and in the report of the Senate Committee it was very clearly indicated that this \$600,000 was earmarked for that particular purpose.

We had deferred the compliance, you might say, with that congressional appropriation—or that expression of congressional will and intent—in this particular fiscal year because of the coin shortage that you referred to, and because of the Treasury's desire to give a priority use of its facilities for the other necessary subsidiary coins.

However, as the end of the fiscal year approached, we were confronted by the dilemma—and to some degree, as I have indicated in my testimony, the coin shortage problem had been substantially reduced—we were confronted by the problem of whether we in effect ignored the expression of congressional will as reflected in the Appropriations Act, and allowed the appropriation to lapse, or whether we should undertake in good faith toward the end of the appropriation year to at least comply in some small degree with that desire.

Now, the decisions that were taken were to begin to comply in good faith. When the committees that had been concerned with the silver dollar on the appropriations side in both Houses indicated to us, through the expressions of leaders of those committees, that they thought it would be an undesirable course from the standpoint of coinage to proceed with this production—which happened to be fully in accord with our own attitudes—we very readily complied with this expression and changed our position.

In the light of all this, I would welcome an amendment by this committee fixing very definitely, or deferring very definitely, for a reasonable period of time any further minting of silver dollars. This

would remove the Treasury from the type of dilemma we were confronted with before where there were obviously contending forces in the Congress, with contending points of view. And we had to look primarily at the Appropriations Act in question for our guidance.

So, without going to the question as to what is an appropriate period for the deferment—I have not given consideration to that, I think perhaps a period of time in which the Joint Commission—if it should be the will of Congress to create such a Commission—is being created and has time to consider the problem would be appropriate and desirable to put at rest this particular issue. Whether it should be 2 years, 3 years, or 5 years is a question which would require some further thought.

Mr. WIDNALL. Thank you, Mr. Fowler.

Just one short question. During the last war, nickel became in such tight supply for a period of 2 or 3 years our nickels were made out of silver. Copper was in such short supply the copper content of the penny was reduced. The Treasury lent silver to industrial users to make electric bus bars rather than being made out of copper. Should we run into another such war emergency might we find we are making our new coins out of materials that would be in extremely short supply?

Secretary FOWLER. I don't think that is likely, although one can never be positive and dogmatic about predicting or forecasting a supply-and-demand situation in times of a war emergency.

However, my recollection, based on experience in both mobilizations, is that the position of the United States from the standpoint of strategic and critical stockpiles had not reached the very adequate position that it is in today, with reference to both copper and nickel. The very unusual demands that were a consequence of the mobilization effort in World War II, before the stockpile program had had a chance to accumulate the necessary supplies, did put tremendous pressure on those two materials. This was also still somewhat of a problem, I think, in terms of nickel during the Korean war, because of the extraordinary demands for nickel for, at that time, the new type of aircraft.

I believe today, although the Office of Emergency Planning would be the more appropriate and authoritative source on this subject, that given the stockpiles that have been created, given the discoveries and development of nickel on the North American Continent which have intervened since the period you refer to, that so far as we can see, so far as the Department of the Interior and the Battelle Memorial Institute—those who have studied the problem—can see, the supplies of copper and nickel are reliable for the long term future to make it a desirable base for coinage. And I would not anticipate the type of shortage problems in those two metals in the wars of the future which are obviously going to be of quite a different character than the one in World War II, particularly the World War II experience.

Mr. WIDNALL. Thank you, Mr. Fowler.

The CHAIRMAN. Mr. Moorhead?

Mr. MOORHEAD. No questions at this time, Mr. Chairman.

The CHAIRMAN. Mr. Stephens?

Mr. STEPHENS. Thank you, Mr. Chairman.

Mr. Secretary, we appreciate the opportunity of having you here before our committee, especially on the occasion of such an important



item as we know is being proposed by this legislation, a change in our coinage.

You have given and other people have given testimony as to the duration of the transition period—estimates from 2 to 4 years.

How long do you think it will be before there will be a more or less general retirement of these coins that have silver in them?

Secretary FOWLER. A general retirement?

Mr. STEPHENS. Yes.

Secretary FOWLER. From the coinage?

Mr. STEPHENS. When predominately the new coins will be in circulation.

Secretary FOWLER. We expect them to continue to circulate along with the new coinage. I think I used the term "indefinitely."

Now, since during the transition period we will arrive at a point at which we will no longer mint the silver coins—the silver dime, the silver 25-cent pieces, or the present type of 50-cent pieces—and since coins, however durable they may be, don't last forever, I should qualify that term "indefinitely." The life of a given coin is roughly estimated to be 25 years. So I would think that some time beyond the next, well, 15 to 20 years, the coins would begin to wear out, would come back in, and be melted down and added to Treasury stocks if they existed at that time.

Now, if, of course, there should be, during that period, a development of any sizable hoarding, then the withdrawal of coins from use through that particular channel might present a particular situation. That will, of course, depend somewhat upon another decision—the withdrawal of the United States from the silver market, so to speak, which we are not suggesting the Congress make at this time, but that it postpone its decision—until it can have the benefit of the views of this Joint Commission taken in the light of the new emergent situation which will follow this transition period.

Mr. STEPHENS. How long did you estimate it will be before you will stop minting any coins with silver in them? I am talking about the ones that are being eliminated.

Secretary FOWLER. Let's take the dime and the quarter—and we don't have a precise production schedule at the moment. But I would roughly estimate that early next year, we would have enough new quarters to release them and stop making the old ones. Then some time about the middle of 1966 we would stop making silver dimes. The time would be when we had built up such an adequate inventory of the new quarter or dimes that it would be feasible to begin to distribute the new coins in the channels of trade. When that quantity was built up adequately and the distribution begun, we would stop the production of the old silver coins.

A similar process would follow in sequence with the 50-cent piece.

Mr. STEPHENS. In your opinion, then, it would be approximately a year after this is in effect before there will be a possibility of stopping the coining of coins with silver?

Secretary FOWLER. Yes; roughly. I would say for the 25-cent piece, which is the one we would hit first, early 1966.

For the dime mid-1966, and the 50-cent piece perhaps the end of 1966.

Mr. STEPHENS. One other question I would like to ask you.

It has been proposed, I think, in the Senate that an amendment be made to this bill to make it a crime for bank officials or bank employees to blackmarket new coins to coin dealers. Would you think we ought to add such an amendment to this?

Secretary FOWLER. Well, I don't have a view on that proposal, currently. I frankly think that as far as the new coin is concerned, this is not going to be a problem. They are going to be produced in such quantity, and we would expect at the time of distribution there would be such a mass distribution, that there would be very little incentive or occasion for a bank official to take advantage of his particular position in that regard. So I really don't believe this is going to be a serious problem, given the program that is outlined here.

If we had a different program, in which there would be a high premium for a substantial period of time on the possession of one of the new coins, I think we might have to take a more serious view of it.

Mr. STEPHENS. Thank you. I believe my time has expired, Mr. Secretary.

The CHAIRMAN. Mrs. Dwyer?

Mrs. DWYER. Thank you, Mr. Chairman.

Mr. Secretary, on page V of the very excellent Treasury staff study, among the important criteria thought to be mandatory in association with this proposed change in coinage is, and I quote—public acceptability in terms of the need for the change, technical characteristics of the coin, degree of convenience, absence of extreme hardships.

With this I most assuredly agree.

But without complete understanding, there could be misunderstanding and family hoarding during the transition to the new coins. Yet in the face of these obvious realities for public understanding, the President's statement and Treasury study were made public on the day of the Gemini space shot. On last night's network TV programs, the coinage announcement was of secondary interest, and the reasons for the change were hardly mentioned. The same occurred in most of this morning's newspapers.

Why, Mr. Secretary, then, did you delay your announcement to coincide with the Gemini space shot? Was this just a coincidence?

Secretary FOWLER. This was a coincidence. When we learned of the conflict in schedule, we felt that in the interests of time we should move ahead anyway. The chairman stated that he would provide this hearing today so that the Congress could move ahead quickly on this legislation. Therefore, we decided against postponement even though, as you quite properly indicated, we knew we would have to take, very definitely, second billing in terms of the news today.

However, I do believe that this matter affects every individual American so closely and intimately that we will not be lacking in the weeks ahead for public writing and description and comment and displays regarding it. I think that the problem of public information is a very real one. We have been quite conscious of it and have had the Treasury staff study, which you referred to, made available so that everyone could have the facts and the observations and the criteria in detail.

Our public affairs office is going to do its dead level best to make available to all interested parties all the information that we have on the various aspects of the problem.



This launching of spacecraft is getting to be such a regular thing in American life, it is pretty hard to avoid a conflict with it in any given week.

Mrs. DWYER. But it was announced 10 days or a week ago when it was going to be. It just seems to me the timing of this report was very unfortunate. Because I anticipate a flood of letters inquiring about a change of the coinage. It seems to me if it had proper publicity, people would understand without writing the hundreds of letters I am sure we are going to get about it.

Secretary FOWLER. Well, I have no further observations to make on it. I would hope that the matter would be adequately covered as a result of these hearings and the other hearings. It is very, very difficult to time all that you do with reference to all other things that are happening. A revolution may break out, or some other difficulty.

We are quite content to have second billing to any given day for this particular problem.

Mrs. DWYER. Thank you.

The CHAIRMAN. Mr. Weltner?

Mr. WELTNER. Mr. Chairman—Mr. Secretary, I, for one, would like to commend you for proceeding to discharge the responsibilities of your office as those responsibilities might require, rather than as the prospective newspaper headlines might indicate. I think it is fine that we have a high ranking official who is proceeding on that basis, rather than on the publicity value of whatever proposals might be made.

I wonder why—if these coins are to circulate side by side—why we need a transition period at all? Why is it not appropriate to start turning these things out?

Secretary FOWLER. I think that too much can be read into our use of the term “transition period.” We mean it to describe that period of time in which the tooling-up process, the acquisition of facilities, the acquisition of the adequate quantities of the new materials for the new coins, the building up of an adequate inventory for initial distribution in series, so to speak—that is what we have in mind when we say “transition period.”

If your question goes to the proposition as to the timing of the release of the new coin, whether that can be done more or less off the production line rather than building up a very sizable inventory, it has been our judgment that the building up of a sizable inventory and the release in more or less mass proportions would avoid any initial problems of hoarding or the kind of problem that Congressman Stephens referred to—some discrimination in the distribution—and that handling it in the way in which I have indicated would take the edge of novelty off very quickly and bring the situation back to a more or less normal attitude as far as the new coins are concerned.

Mr. WELTNER. One other item that interests me—

Secretary FOWLER. I might say, also, that we learned a lesson in the handling of the Kennedy half dollar. It went out in smaller quantities and did give rise to hoarding. Perhaps there would have been the same degree of personal acquisition of the coin for memento or family use. But we do feel that in the light of that experience, when a new coin comes out, that if it can be distributed initially in mass quantities, this is the preferable course.

Mr. WELTNER. There is one other request I would like to make, and that is to be furnished a table showing the intrinsic value of the

metals in the existing silver coinage, as compared to the metal in the proposed new coinage.

Secretary FOWLER. Such a table will be readily available.

Mr. WELTNER. Thank you, Mr. Chairman.

(The information referred to follows:)

*Intrinsic value of present and proposed coins*

[Per piece]

Denomination	Present coins <sup>1</sup>	Proposed coins
10 cents-----	\$0.094	<sup>2</sup> \$0.002
25 cents-----	.235	<sup>2</sup> .005
50 cents-----	.469	<sup>1</sup> .197

<sup>1</sup> Includes silver and copper.

<sup>2</sup> Includes copper and nickel.

The CHAIRMAN. Mr. Hanna?

Mr. HANNA. Thank you, Mr. Chairman.

There are four points I would like to make. The first one has to do with the balance-of-payments problem. As I looked at your chart, it occurred to me that with 550 million troy ounces being used in the United States this year, with the production being somewhere between 36 and 37 million troy ounces, that we were buying—assuming we had run out of our supply here in the United States, and we were buying this, we would be buying foreign silver to make up the difference between what we produce and what we use, which would appear to me to be somewhere between \$650 to \$700 million worth of silver we would have had to be buying on the foreign market. And I ask you: Is there not a future balance-of-payments problem if we continue to use silver in these large quantities?

Secretary FOWLER. Without following the arithmetic, the total consumption figure you mentioned, 550 million, was the total estimated consumption for the free world. The total estimated consumption in the United States for 1964 was substantially less than that. Our industrial consumption in 1964 was 123 million ounces and coinage use, 203. So our total use in the United States was 326 million ounces for that year. However, that is somewhat a matter of detail.

Your point that our use of silver does entail a substantial importation from abroad is a very real one, but in that 326, just again to quantify it, a large portion of that use in the United States in 1964 was from our own stocks and, thereby, diminished any potential drain.

Mr. HANNA. I understand. May I go to point 2?

Secretary FOWLER. We imported in the United States in 1964, just to quantify this, about 52 million ounces, which is a substantial amount.

Mr. HANNA. You might put in the record what you think you might import for next year.

(The information requested follows:)

U.S. imports of silver, excluding relatively small amounts of coin, averaged just under 60 million ounces annually in the 5-year period 1960–64. During the first quarter of this year, the Bureau of the Census reports imports of 11.2 million ounces, possibly somewhat reduced in amount by a dock strike which ended in mid-February. Any estimate of the volume of silver imports for the full year



1965 is necessarily tentative and very approximate. However, a reasonable expectation might be for imports somewhere in the neighborhood of 55 to 60 million ounces.

Mr. HANNA. Another thing for the record, on point 2. I am interested in the seigniorage position. Would you kindly put down for the committee what your present position is on seigniorage on the nickel, dime, quarter, and half, and what that position will be when you change to the new metals?

Secretary FOWLER. We will supply that for the record, sir.

(The information referred to follows:)

*Seigniorage, estimates current coins and new alloy coins*

[Seigniorage equals difference between face value of coins and the cost of metal in the coins]

	Estimated seigniorage at \$1,000 face value	Estimated seigniorage, at fiscal year 1965 production rates	
		Millions of dollars	Millions of pieces
Present coins 900 silver 100 copper:			
10 cents:			
Face value.....	\$1,000.00	102.0	1,020.0
Cost of metal.....	935.27		
Seigniorage.....	64.73	6.6	
25 cents:			
Face value.....	1,000.00	173.0	692.0
Cost of metal.....	935.27		
Seigniorage.....	64.73	11.2	
50 cents:			
Face value.....	1,000.00	96.0	192.0
Cost of metal.....	935.27		
Seigniorage.....	64.73	6.2	
Total seigniorage all subsidiary coins.....		24.0	1,904.0
New alloy coins:			
10 cents:			
Face value.....	1,000.00	102.0	1,020.0
Cost of metal.....	58.61		
Seigniorage.....	941.39	96.0	
25 cents:			
Face value.....	1,000.00	173.0	692.0
Cost of metal.....	58.61		
Seigniorage.....	941.39	162.9	
50 cents:			
Face value.....	1,000.00	96.0	192.0
Cost of metal.....	432.37		
Seigniorage.....	567.63	54.5	
Total seigniorage all subsidiary coins.....		313.4	1,904.0
Present minor coins (no change):			
5 cents cupronickel:			
Face value.....	1,000.00	78.7	1,573.0
Cost of metal.....	152.67		
Seigniorage.....	847.33	66.7	
1-cent bronze:			
Face value.....	1,000.00	37.8	3,779.9
Cost of metal.....	328.80		
Seigniorage.....	671.20	25.4	
Total seigniorage all minor coins.....		92.1	5,352.9

Source: Bureau of the Mint, June 7, 1965.

Mr. HANNA. On point 3, I should like to point out that I have a very strong feeling about the half dollar. First of all, I think that all of us who look objectively at it might agree it was the biggest mistake we ever made to make the Kennedy half dollars, in terms of our silver shortage. I also think the half dollar is a psychological point at which people stop looking so heavily at utility of coin and start thinking about the depositive value, of it being a matter of themselves saving the value of the coin. So I don't think we should emphasize the half dollar. That is my own personal belief. We think we ought to put out more dimes, nickels, and quarters, and go easy on the half dollar. I don't know whether you agree with that.

Secretary FOWLER. We do agree with you on that. And I think we have in mind the other fact which is related; that, as a practical matter, you can be more flexible in your production run on the half dollar because, if we run into any problem as a utility matter, two quarters will serve equally well. And we agree with you that the emphasis in this program has to be on the dime and quarter.

Mr. HANNA. As the last point—we know what the acceptability is for the coins made with the 400-fine silver. You apparently believe that the public will accept the cupronickel coins.

My question is: Has the Treasury or the Mint undertaken any studies or any trial programs to see what the acceptability would be?

Secretary FOWLER. No, we have not taken any polls or surveys or studies in depth of the personal reactions of the public because we would have given rise, I think, to a lot of conjecture.

Mr. HANNA. Do you think that the public will accept these new coins?

Secretary FOWLER. I certainly do.

Mr. HANNA. On what do you base that belief?

Secretary FOWLER. Well, in addition to reactions of all of us around—maybe I am not a very good yardstick for this, but they seem to be very acceptable, and handle well, and their appearance is attractive—I am inclined to agree with the chairman. It is what the coin will buy; as long as a quarter will buy me a quarter's worth of goods, I am not concerned, at least I realize there are a number of other people who have entirely different tastes. But the predominant element of acceptability here seemed to us to be as a function of use rather than in terms of appearance.

Mr. HANNA. Thank you.

Secretary FOWLER. And those that are of course concerned about the appearance of the coin, we think that the new coins will be reasonably attractive and acceptable, and we think that the silver 50-cent piece will be, continue to be, a prestige coin which will appeal to those for which coinage has that particular ring.

Mr. HANNA. Thank you, sir.

The CHAIRMAN. I would like to clarify two points for the record.

No. 1—all coins, all paper money, are all of equal value as legal tender. You can pay a million dollar debt with copper cents if you want to. That has not always been true. You can pay any debt with 5-cent pieces or 25-cent pieces, and it makes no difference. It is all acceptable legal tender.

With respect to 50-cent pieces, isn't it true that vending machines generally don't use 50-cent pieces?

Secretary FOWLER. Up to now that is the case, although I think there are some isolated uses.



The CHAIRMAN. The only place I know of is Las Vegas, for instance, in the gambling devices.

Secretary FOWLER. There are also isolated uses in coin-operated drycleaning establishments and change makers.

The CHAIRMAN. Mr. Brock?

Mr. BROCK. Mr. Secretary, we appreciate your being here today.

I am somewhat concerned over the point of the 50-cent piece containing some degree of silver. You say that we need a prestige coin. I would point out that I think we have a prestige coin in the silver dollar, which you are not affecting, is that not true?

Secretary FOWLER. That is right. They are not very much around these days, however.

Mr. BROCK. Isn't it true there are not very many around because it is a prestige coin and it does have silver content?

Secretary FOWLER. I think it is mainly because they haven't been produced and distributed sufficiently in mass supply.

Mr. BROCK. But we have some evidence of hoarding of silver dollars, because the silver content in the silver dollar is currently worth a dollar. If the price goes up any more, it will be worth melting them down.

Secretary FOWLER. Correct.

Mr. BROCK. Now, you point out that we are going to maintain the 50-cent piece as our prestige coin. Are you not encouraging the hoarding of this particular item, even though the silver content is reversed down to 40 percent?—by referring to it as a prestige coin, you do give people a psychological incentive to stash them away.

Secretary FOWLER. I say if they want to stash away anything, that is what it tends to rivet on. You are quite right in that. However, I am not sufficiently conversant with the mental attitudes of hoarders. I frankly don't understand a lot of it, and why they do it. And I believe that this program here, in many ways, is designed to discourage and to flatten out whatever these tendencies are to hoard coins for the sake of realizing on them in a melted-down form.

Now, as to the collection of coins for family purposes, for gifts for children, for those people that are collectors and many, many other things, I think this is a rather neutral program in that regard. I think it doesn't affect it one way or another, except we are taking measures in the transition period by dating, and devices of that sort, to minimize any withdrawal from the existing coinage supplies, to minimize any drain, I might say, during this transition period.

Mr. BROCK. I am quite honestly concerned. I think we are a couple of years late in doing what we are doing. But I think there is a possibility that by naming it a prestige coin, just that one fact, is asking for trouble.

Let me talk about the general situation with regard to silver. Are you currently selling silver outside of the area of redemption of silver certificates?

Secretary FOWLER. No.

Mr. BROCK. You have approximately a billion ounces of silver; is that correct?

Secretary FOWLER. That is correct.

Mr. BROCK. That would be about enough, then, to cover the outstanding silver certificates we have? That is fairly close, isn't it?

Secretary FOWLER. We can more than cover it.

I think our margin, our additional margin over and above, would be about 275 million ounces.

Mr. BROCK. You are, are you not, in cooperation with the Federal Reserve System, pulling out silver certificates from circulation as possible, without redeeming them—replacing them by Federal Reserve notes?

Secretary FOWLER. That is correct.

Mr. BROCK. Why, Mr. Secretary, in the light of the enormous increase in demand, not only for industrial but for defense purposes in the use of silver, why do we not provide for a strategic silver reserve in this bill, then, or propose new legislation to amend—

Secretary FOWLER. My understanding is that that legislation or that type of proposal is being considered separately as a result of the work and at the behest of the Office of Emergency Planning. I think the two proposals are running concurrently, or will run concurrently, in the Congress. But we would have had some jurisdictional problems.

Mr. BROCK. I hope they do, because I think it is important that we consider this.

Secretary FOWLER. I think there was an announcement yesterday from the Office of Emergency Planning on this matter, indicating that they have a target of approximately 165 million ounces of silver that they thought would be necessary and desirable for the stockpile.

Mr. BROCK. The thing that has concerned me is that if people began to realize just how critical this situation was, and if they began to hoard silver certificates, then you would have a situation in which you had very little latitude, very little leeway, for the stockpile.

Secretary FOWLER. We would have substantially enough more to take care of this problem.

Mr. BROCK. For the current year. But the fact is that our consumption is considerably in excess of world production—and this surplus isn't going to last for long.

Secretary FOWLER. I was speaking in terms of redeeming silver certificates. We still would have enough.

Mr. BROCK. It is true you would have \$200-plus million worth of silver—

Secretary FOWLER. Ounces of silver.

Mr. BROCK. Which is in excess of the request for the defense stockpile.

But the point is that we are using—I have forgotten whether it is 100 or 200 million ounces, in excess of world production today; are we not?

Secretary FOWLER. I can't follow your figures. But we are using substantial amounts in excess of production.

Mr. BROCK. We are consuming substantially more than we are producing.

Secretary FOWLER. There is no question about that.

Mr. BROCK. And we still will be consuming more than we produce even if we stop all silver coinage.

Secretary FOWLER. No question about that.

Mr. BROCK. So silver is a critical material.

Secretary FOWLER. No question about that. It is a critical material from an industrial standpoint, and I think that even given a solution in the treatment of the coinage problem—whatever you do



about coinage and whether or not you stop the use of silver completely in coinage—it will still be a critical problem. The solution of it is not at the moment within the reach of our handling of the coinage situation.

The question that is before the committee in regard to the continued use of silver, I think, is a very limited one. It is whether or not, after the transition to the new coinage, it is worth 15 million ounces a year, which is roughly 5 percent of the current use of silver for coinage, to maintain a link with silver in the form of this reduced 40-percent silver 50-cent piece. That is a very real issue. I think it is one that I hope you will resolve in this legislation, along the lines that the President has recommended, by providing for this type of coin. It may be that years from now—4, 5, 7 years from now—this will be a burning issue before the proposed Joint Commission.

Mr. BROCK. Well, I consider that to be one of the things we should consider. But I think our responsibility is considerably broader than that. If it were me, I would like to see the Treasury consider, as these new coins come out in full production, actually pulling silver coins off of the market as they are doing with silver certificates, because I think there is quite a distinct possibility that we will be in a critical need situation in the coming 4 to 5 years.

Secretary FOWLER. Well, on the question of the rate of withdrawal, what we do now is to take a coin back when it is worn out. We retire it when it comes in; we put the silver in stock.

Now, the question you raise is whether we continue that process or whether we should accelerate the withdrawal after your new coinage is in use in adequate supply. This is a question which I think is quite appropriate to ask. It is one of the things that was behind the proposal for this Joint Commission on Coinage. I think if there is any difference between us it is a question of the timing of that decision. We felt that the timing of the decision on the rate or method of withdrawal of the existing coinage is one that could be better taken after the new system was in operation, and any possibility of a coinage crisis, you might say, had been averted. Meanwhile, we need silver coins for circulation.

Mr. BROCK. I hope we don't delay so long that we face a serious crisis in defense needs in the silver that we have.

Thank you.

The CHAIRMAN. Thank you, Mr. Brock.

Mr. White?

Mr. WHITE. Thank you, Mr. Chairman.

Mr. Secretary, it is very good to have you here.

I think that we should put in proper focus the transition period. I believe you would be incorrect if you would leave the idea that we are talking about a 15-year period.

It is my understanding—and I assume there is some agreement in your office—that the transition period is the length of time that we can defend the price of silver at \$1.29, which is necessary during any transition from one coinage to another, no matter what the new coinage would be. We must protect the existing coinage—\$1.38 per ounce is the value of the silver contained in the dime, quarter, and one-half dollar piece.

Now, isn't the transition period really predicted on the length of time that you can defend the price at \$1.29?

Secretary FOWLER. I think everyone can have his own "transition period," so to speak. But the one I have in mind, when I use the term, is the period of time it takes to produce and distribute and to have an adequate supply of the new coins in use, so that trade and commerce that is related to and dependent upon coinage is not subjected to the threat of any shortage.

Mr. WHITE. Let me ask you this question then:

If we did not have our stock of silver, which we started out with in 1963, do you believe that the price of silver due to the shortage that you talked about here, and the lack of supply, would be at the \$1.29 price today, or is not the \$1.29 price a direct result of the redemption of silver certificates at that price?

Secretary FOWLER. I think so.

Mr. WHITE. Well, therefore, to continue to defend that price, we have to take a look at how long the existing stocks of silver will last; is that correct?

Secretary FOWLER. That is certainly true.

Mr. WHITE. How long do you believe the existing stocks of silver will last at the present rate of redemption?

Secretary FOWLER. I would not like to make an estimate on that. I think it will be a sufficient period of time to affect in an orderly and nondisruptive way the program that we are presenting to the Congress here.

Mr. WHITE. What was your rate of redemption last year, Mr. Secretary.

Secretary FOWLER. 141 million ounces.

Mr. WHITE. How much silver was freed during this same period?

Secretary FOWLER. About twice that.

Mr. WHITE. It is my impression it is near 300 million ounces. And that means with a billion ounces, you have 3 years' supply. Therefore, the transition of one coinage to another definitely must take place within the 3-year period.

Secretary FOWLER. That is correct.

Mr. WHITE. And, therefore, you can further say that the 7-cent nickel made during World War II, when we substituted silver for nickel, is presently being melted down. I have a block of the silver in my desk refined from silver nickels. So, therefore, we have to face the possibility of our subsidiary coinage being melted down if the price of silver would exceed \$1.385; is that correct?

Secretary FOWLER. We include a provision in the law that we recommend for the creation of standby controls over the melting and export of coins.

Mr. WHITE. Well, you didn't necessarily make a provision in this law. You indicated a possibility of such a provision. You did not make a definite recommendation.

Secretary FOWLER. We put it on a standby basis, against the possibility or the probability that we don't really foresee. But we would have recourse to it if necessary.

Now, I think there is set forth clearly in the President's message the rationale of what we are trying to do. We think that our stocks are adequate to protect the silver coinage during the period in which the new coinage comes into effective use. We do not wish just to look to one side blindly and ignore the possibility that our judgment might be wrong. We feel that an additional protection for the existing



coinage should be requested and it is requested. It takes the form of this standby authority to institute controls over the melting, treating, or export of U.S. coins—something that today would be legal could become illegal, could become a crime if it becomes necessary.

Mr. WHITE. It would take some act of Congress, however, to do it.

Secretary FOWLER. That is what I am saying—with the action recommended here. We hope it won't become necessary to issue such regulations. We don't think it will. But the tool in the closet would be a useful and desirable piece of legislation.

Mr. WHITE. Why didn't you also suggest in your legislation the possibility of end-use certificates to see that this silver that is purchased or redeemed from the Treasury went into the channels of industry? It would seem to me a logical use of such a procedure to provide that the industry was supplied with silver.

Secretary FOWLER. Well, I think you will find in the studies a good deal of commentary on the pros and cons of this particular question of end-use certificates. We simply made a judgment that at this particular time, as we see it, this would be a counterproductive and unnecessary nuisance for trade and commerce.

Mr. WHITE. Why suggest it for the coinage, then?

Secretary FOWLER. Well, coins are one thing, and silver is another.

Mr. WHITE. I don't really see the difference today when we are talking about the redemption of silver certificates.

Secretary FOWLER. We think there will be quite a difference in the period ahead.

Mr. WHITE. The bullion that you hold at West Point? There is a great difference?

Secretary FOWLER. A great difference between what?

Mr. WHITE. Between the coinage and the silver you hold at West Point—is there a difference?

Secretary FOWLER. Well, for one purpose there is no difference. For other purposes there are. The question of placing, in this particular situation, a complete governmental control over the industrial and artistic use of silver down to the various job shops is a different question, I suggest, from the one—related, but quite different and much more serious—than providing standby authority we have asked the Congress to enact which would prohibit the melting of U.S. coinage. End-use controls involve a much sharper and more rigid degree of control with lots of additional consequences.

The licensing of silver, would, we believe, tend to result in a two price system, here and abroad. You would have the legitimate industrial, professional, artistic uses, at the \$1.29 figure; you would eventually have perhaps a higher black market price paid by speculators and hoarders. And if this price in the second market, so to speak, went substantially beyond \$1.38, it would tend to make our existing coins disappear, either into hoards or through melting.

So there would be a grave risk, I think, attendant upon the institution of end use controls of the sort you seem to suggest.

Mr. WHITE. Well, Mr. Secretary, isn't the whole transition period—speaking of transition again—predicated on the cocirculation of the two coins side by side, and also the continued defense of the price of silver at \$1.29?

Secretary FOWLER. That is correct.

Mr. WHITE. And if your assumption is correct, we will end up with a change in our coinage.

I would like to ask you one further thing. I have a list of questions I would like to submit to you for answers for inclusion in the record.

Secretary FOWLER. I would be delighted to have those questions. We will work on them over the weekend and try to get the answers to you just as soon as possible.

Mr. WHITE. Thank you.

(The following questions and answers were submitted for the record.)

#### ANSWERS TO QUESTIONS SUBMITTED BY MR. WHITE TO SECRETARY FOWLER

Question 1. Is the solution offered as temporary relief only? If so, why not seek a long-range solution now?

Answer. Our proposal is not offered as a temporary solution. As the President said in his June 3 message: "This legislation \* \* \* will insure a stable and dignified coinage, fully adequate in quantity and in its specially designed technical characteristics to the needs of our 20th-century life. It can be maintained indefinitely, however much the demand for coin may grow."

However, certain issues such as the timing and circumstances under which the Government should continue to maintain the price of silver indefinitely, and the future of the silver dollar, are better decided in the future on the basis of experience. For this reason, and because it is possible that unforeseen problems might arise, or technological developments affecting our coinage, might occur, we have proposed the establishment of a Joint Commission on the Coinage to study and report on developments.

With respect to the basic program we have recommended, however, we have every reason to expect, as the President said in his message, that "the recommendations being made for a new coinage are sound and durable."

Question 2. Why is the silver content of the dollar to remain the same? If sales of silver at any price are authorized, as contained in section 6 of the bill, what is the need for keeping the monetary value of the dollar the same?

Answer. The discretion in the bill with respect to sales of silver is to permit operations within a narrow range of the \$1.29 plus per ounce price, representing the monetary value. To help in maintaining the present market price for silver, and prevent speculative hoarding of the existing silver coinage, we think it is important psychologically not to make any change in the monetary value of silver which coincides with the \$1.29 plus price. Since 1792, the monetary value of silver has been set by the silver content of the silver dollar. Thus even though we would continue to redeem silver certificates at \$1.29 a troy ounce, a change in the content of the silver dollar could not help but put an upward pressure on the price of silver.

Question 3. In section V of the Treasury staff study, two conditions for a transition to a reduced silver content coin are set forth, namely:

(a) There be no coin shortage at the time.

(b) The existing coin should be recoverable.

Why are these conditions unique to a change to a reduced silver content coin? Do they not equally apply to a change to any other metal?

Answer. A reduced silver content of coins, in this instance, refers to reducing the silver content of all subsidiary coins, rather than only one, as recommended by the President. The conditions referred to here are crucial for a change to a system of reduced content of all silver subsidiary coinage because to have enough silver to carry out such a program would require the recovery of the silver in most of the existing high-content silver coinage. In turn, the existence of a coin shortage makes any substantial scale of recovery of the existing coinage virtually impossible.

The conditions do not apply with similar force to the transition to a system in which nonsilver alloys are used in the 10- and 25-cent pieces. Subsidiary coin shortages are unwelcome in any case. But, there is an important difference in that with silver removed from the 10- and 25-cent pieces. In this case the problem of overcoming existing subsidiary coin shortages becomes one of production and distribution, uncomplicated by the rapid depletion of the new coinage material itself. The Mint has given a graphic example in the case of pennies and nickels of the way in which severe shortages can be quickly overcome by a massive production effort.



The further and very significant difference with nonsilver alloys is that the existing silver coinage does not have to be recovered so that two coins can be made from one. Instead, the existing coinage is left in circulation, side-by-side with the new coins. If it should develop that any substantial portion of the existing coinage were being withdrawn from active circulation by the public—and no such development is anticipated—higher levels of production of the new coins should be able quickly to offset any conceivable scale of withdrawals.

There would, in fact, seem to be more reason to expect sizable public withdrawals of the existing silver coinage if the Government were withdrawing high-content silver coins in order to replace them with low-content silver coins. Such withdrawals would add to any developing coin shortage. Under the proposed legislation the public will be able to retain and use the existing high-content silver coinage.

Question 4. Do you have any estimates of how much silver coin and bullion is held for speculative purposes? Why are your figures for silver consumption not broken down along these lines? Would you supply the committee with such figures?

Answer. The Treasury has not prepared any estimates of silver coin and bullion which is held for speculative purposes. Although there are some indications that silver bullion is being held for speculative purposes (last year redemptions of silver certificates for silver was greater than total U.S. use of silver for industry and the arts), precise information on this subject is very limited. We do have names of individuals and companies who have redeemed certificates, but it would be difficult to determine positively that such redemption transactions were for speculative purposes. It is also difficult to estimate very precisely the degree of coin hoarding. In view of the above, the estimates for silver consumption are not broken down along these lines.

Question 5. How do you explain an average consumption of silver for coins of 40 million ounces from 1949 to 1960, and the doubled, tripled, quadrupled and more in later years?

Answer. It would be difficult to explain adequately the reasons for the recent substantial increase in the use of silver for coinage, but a number of items can be cited as contributing factors. Some years ago, the number of coin collectors or numismatists was quite limited, and most numismatists were content to collect one or two coins of each denomination. In recent years, with increased prosperity prevailing throughout the country, the coin collector ranks have increased substantially and their number is now estimated at approximately 10 million or more. Collecting habits have changed, and instead of saving one or two coins, many persons, especially those who speculate in coins, have adopted the habit of saving rolls and bags of new coins, the latter referred to as "mint-sealed bags" and putting these coins away in hopes of a substantial appreciation in numismatic value, several years in the future.

Coin dealers have become very active in this field, and have encouraged the activities of new collectors by numerous advertisements with captions such as "How To Retire in 10 Years With an Income of \$10,000 Per Year" and by various other schemes for selling coins at premium prices. In addition to collectors and dealers, speculators have also entered the market and have withheld large quantities of coin, both new and used, from the market for sale at premium prices.

There are many factors, in addition to those cited above, which require additional quantities of coins. These include the recent very substantial growth in the coin vending and servicing machine industry; the expanding population; coins needed for children's school lunches; and increasing requirements for highway toll booths, parking meters, automatic laundries, and many related business activities.

Question 6. On page 15 of the study, it said that in a change to a reduced silver content coin, "It is not self-evident that Treasury stocks would last."

(a) Should you not also count on silver from returned coins, industrial recovery, and dehoarding?

(b) Why must it be self-evident?

Answer. (a) A full examination of the feasibility of reduced content silver coinage might well include some consideration of the silver that would become available to the Treasury in the form of returned coin. An effort was made to allow for the effect of such recoveries in section V of the Treasury study.

(b) It was mentioned at page 16 that the adequacy of Treasury silver for a transition to reduced content was not "self-evident." At the end of the paragraph in question it is stated: "The problem of the transition to silver coinage of reduced content is examined more fully in section V of this study."

There is no reason why the probable lack of success of such a transition would have to be self-evident. However, a transition to reduced content silver coinage certainly could not be recommended unless study of the problem indicated that there was every indication that the transition could be negotiated successfully. The Treasury study concluded that this was not the case on any reasonable set of assumptions under present circumstances.

Question 7. Referring to page 16 of the study, why would speculation in silver be more accelerated by a change in monetary value than by knowledge that the Treasury silver is being depleted by the indiscriminate sales authorized in the bill?

Answer. Comparison of the two situations on the basis suggested by the question is difficult since no indiscriminate sales of silver are contemplated. If the proposed legislation is enacted, the redemption of silver certificates required by law will be continuing against the background of sharply reduced silver requirements for coinage, and the prospect of any early and destabilizing increase in the market price of silver will become remote. However, provision for sales of silver not required as backing for silver certificates simply offers additional assurance that the market price of silver will not rise above the existing monetary value. Sales would not be authorized at any price less than the monetary value of silver. By providing assured access to Treasury silver stocks, the net result of the proposed legislation should be a pronounced dampening, not on acceleration of speculation in silver.

On the other hand, the reference at page 18 of the study was to the effect of an increase in the monetary value of silver while a transition was being made to base alloy subsidiary coinage. Such an increase in the ceiling to which silver prices might rise could very well have the effect of encouraging some speculation in silver, even though coinage use of silver was being cut back. If the monetary value were raised while silver was being continued in the coinage, very heavy speculation in silver would surely result. Any change in the monetary value of silver during the transition to a new coinage system would be ill advised.

Question 8. Why does the study base its figures and conclusion for rejecting a reduced silver content coin on a 500 fine silver coin, when in fact a 400 fine coin is perfectly acceptable and recommended?

Answer. Section V of the study considers the transition to reduced content coinage for the cases of subsidiary coinage of both 400 and 500 fineness. Several special assumptions and cautions noted there may bear repeating here.

(1) It was assumed that the crash coinage program would have removed all shortages of subsidiary silver coinage by the end of fiscal 1966, after which coinage requirements would fall to less than one-half of current levels.

(2) Very optimistic estimates were made of the amount of the existing coinage that might be recovered. It was pointed out (p. 64) that the estimated scale of recovery was selected not because it was inherently plausible, but simply to work out the implications of attempting a transition to reduced content silver coinage under favorable circumstances.

(3) It was emphasized at page 64 and elsewhere (for example, pp. 66, 69, and 73) that under present circumstances, with shortages of silver subsidiary coins still persisting, there was no realistic possibility of recovering anything like the amounts of old silver coin that would be required for a successful transition.

Section V concluded that under existing circumstances the risks would be intolerably great in the case of a transition to either 400 or 500 fineness subsidiary coinage, although the situation with 400 fineness was not quite so hopeless as with 500 fineness. It is not correct to state that the study "bases its figures and conclusion on a 500 fine silver coin."

The study did suggest in an appendix to section V that a clad silver 50-cent piece of 400 fineness could be continued in our coinage system for a good number of years, perhaps indefinitely. However, the estimated 15 million ounces annual use of silver that might eventually be devoted to this purpose would be a fraction of the requirements if an attempt were made to retain silver throughout the subsidiary coinage.

Question 9. Referring to conclusions on pages 30 to 36 that it is merely a matter of conjecture how the price of silver must go to put supply and demand into alignment. Was any attempt made to reach scientific conclusions about this? If none were reached, why does the study so emphatically state that there isn't enough silver for reduced-content coins?

Answer. It is true that the discussion in the study at pages 30 to 36 did not arrive at a precise, single-valued forecast of the price level at which silver markets might eventually be equilibrated. However, that discussion did establish a strong presumption that silver prices would rise about \$2 per ounce by 1980 or



1985 if subject only to the forces of private supply and demand. This conclusion found some indirect support in the detailed trend projections made by Battelle in the course of their parallel investigation, and in a recently released study of the Department of the Interior (Information Circular 8257). Significantly enough, the latter investigation determined (pp. 17-18) that even with a rise in silver price to \$2 to \$3 an ounce, the early effect upon output would not be great.

Every attempt was made to examine the silver supply situation objectively and thoroughly. It is not believed that any important published sources of information were left uninvestigated. It is true, of course, that "scientific conclusions" are difficult to draw in this area and some residual areas of uncertainty inevitably remain. For this very reason, 500 fineness silver coinage was not ruled out as a result of the discussion at pages 30 to 36 and its consideration of the level that silver prices might reach. The study's conclusion that there is not enough silver for reduced content subsidiary coinage was reached only after careful investigation of the difficulties of achieving a successful transition (sec. V).

Question 10. On table 2-A of page 70 in the Treasury staff study, the indication is that the transition to a 40 percent silver content for all coins could be made with a surplus of 262.3 million ounces in Treasury silver remaining in 1972. Surely, there is no question but that 40 percent silver halves, or even quarters could be made; is there?

Answer. The same special assumptions and cautions noted in the answer to question 8 above are applicable in interpreting table 2-A. It is doubtful whether that table, itself, adds much to the case for a single coin. However, there is every reason to believe, as the question suggests, that some 40 percent silver half dollars can be produced. As noted in the appendix to section V, an eventual annual coinage of 100 million of these would use about 15 million ounces of silver. Whether or not even such a limited scale of coinage could be continued indefinitely is not certain. However, if it could not, the shift to another alloy in the half dollar would probably not present serious difficulties. The retention of any silver in the dime or the quarter is not a practical possibility.

Question 11. Since the assumption is that the cupronickel coins will circulate side by side with the present coins, would there not be over 1 billion ounces of silver returned to Treasury from recovered coin? What do you think the Treasury should do with this silver?

Answer. It is contemplated that the new coins will circulate side by side with the present coins indefinitely. Over time there may well be gradual recoveries of the existing coinage in the ordinary way as it becomes worn and is returned to the mint. This silver might then be added to Treasury stocks if such existed at that future time. Aside from minting the new half dollar, the question as to what would be the most appropriate use for this silver is a difficult one to answer at this time. Along with the broader issue of the eventual role of the Treasury in silver markets, these are matters which the projected Joint Commission on the Coinage can better examine as further experience is gained and with the new coinage system firmly installed.

Question 12. Why would the Treasury object to a standby power in the bill to mint 40 percent silver coins if the cupronickel coins are proven unacceptable by the public? Would it not be a wise precaution?

Answer. Careful Treasury staff studies, confirmed by independent studies, make it clear that Treasury silver stocks will not be adequate to keep silver in more than one of our coins. We firmly believe that the coins proposed will be acceptable to the public. In the unlikely event that they are not, the solution will not be, indeed cannot be, to switch to coins containing silver. In that event we would have to propose to the Congress some other nonsilver alloy.

Question 13. How can the Treasury expect the Congress, which has the primary responsibility for providing coins, to make a wise choice about this legislation within a week or 2 weeks, when it took the Treasury many months? Would you recommend a month's study of the problem by Congress?

Answer. I would expect the Congress to take whatever time it requires to study the matter. The President's recommendations, as you point out, are the results of many months of study. We are making available all the technical information and analyses which we developed during this time. I would expect Congress to study and review very thoroughly the materials we have developed, but of course, the time required for this is a matter for the Congress to decide.

Question 14. Since you are so confident about the side-by-side circulation of the cupronickel-clad coin, would you be willing to take a public opinion poll on it, and give the results to the Congress before further action is taken on the proposed legislation? If not, why not?

Answer. In my judgment, it would be impossible to conduct a poll on this subject. It would be necessary not only to give the pollees samples of the coins but also to qualify the questions severely. Obviously, silver coins are more attractive than the new material and would be preferred. But you can't ask the man on the street to assess the very complicated silver supply situation. That is the job of the Treasury, with the people's elected representatives passing judgment on our recommendations.

Question 15. You have said that the full faith and credit of the United States will stand behind the new coins. Do you contemplate backing the cupronickel coin with Government securities, or gold, as is the case with paper money?

Answer. The new coins, as is the case with the existing coins, will be freely exchangeable for our paper currency. Thus, in effect the backing for our coinage is, and will be, the same as the backing for our currency. In the final analysis the value of all of our money, coinage and currency, bank deposits, and the like, is dependent upon the strength of the Nation's economy and not upon its intrinsic value or the technical resources behind it.

Question 16. Did the Treasury study encompass an analysis of H.R. 4184? How do you analyze its provisions?

Answer. We have analyzed H.R. 4184, and we do not find the proposals in it feasible. Essentially, it is our conclusion that we cannot count on enough silver during the period of implementation of a coinage program to keep silver in more than one coin. For this reason alone we are opposed to the bill. In this connection I direct attention to the conclusions drawn by the Treasury staff study and the Battelle study.

H.R. 4184 also suffers from the following defects:

(1) By changing the reserve requirements for silver certificates, it amounts to a partial repudiation of the Government's obligation on this currency, which would be of doubtful constitutionality.

(2) By indicating at this time a monetary price for silver of \$4 per ounce, the bill would have a tendency to generate increased speculation in, and hoarding of, silver coin and bullion. This psychological pressure would be present in spite of the authority contained in the bill to sell silver at the \$1.29-plus-per-ounce price.

The CHAIRMAN. All right. Mr. Gettys?

Mr. GETTYS. Mr. Chairman. Mr. Secretary, you have stated that public acceptance of the cupronickel coins seems to be assured. Do you have any real basis for that conclusion, or evidence that they will be generally accepted?

Secretary FOWLER. The outward appearance of the coin is, of course, just like the nickel that we are all used to today. The similarity between the two in appearance would be, I think, quite striking. The inscription—the engraving will be identical with present coins. The most noticeable difference will be the fact that the edge of the coin will have a coppery appearance. To us this doesn't seem to be such a radical difference.

Mr. GETTYS. If the prognostication proves to be incorrect, it would more or less create pandemonium, would it not?

Secretary FOWLER. It would be a right rough situation.

Mr. GETTYS. I was just wondering if it would not be wise for the Treasury to have standby authority maybe to mint some silver content coins. Would that be acceptable?

Secretary FOWLER. Well, I think it would have some other effects that would be undesirable. We think it is very important here that we take the decision now, at this time, to end the coining of silver dimes and quarters.

Mr. GETTYS. You have considered what I have referred to?

Secretary FOWLER. That is right. If we had to turn to some other alternative, I think the alternative would not be in that direction.

Mr. GETTYS. Thank you.

The CHAIRMAN. Mr. Mize?

Mr. MIZE. Thank you, Mr. Chairman.



Mr. Secretary, what is the melted down value of the present 50-cent piece?

Secretary FOWLER. About 46 cents.

Mr. MIZE. I am sorry that the new 50-cent pieces are to have any silver content at all.

Is it a fact you are authorized to mint these new 50-cent pieces, but you don't really have to, do you?

Secretary FOWLER. Well, certainly there would be a considerable degree of flexibility as to the timing, the quantity, and the pace.

Mr. MIZE. One other question. Are these new coins to be dated?

Secretary FOWLER. The authority we are requesting is that we be allowed to use as a date for a substantial period of years, a given date, so that the premium on having one dated 1966 and another dated 1967, 1965, will be at a minimum.

Mr. MIZE. Thank you.

The CHAIRMAN. Mr. Todd?

Mr. TODD. Mr. Fowler.

Thank you, Mr. Chairman.

I was noticing these coins in this pretty case here.

I am skeptical of red lights at the meat counter and green lights at the vegetable counter. I wondered if possibly Monday we could see some coins not encased in anything if we promise to give them back to you.

Secretary FOWLER. I think we can have some. We will guard them very carefully as they move around. But I think members of this committee will have a little momentary, temporary distribution, so to speak, so you can feel the heft of it and turn it around and look at it.

Mr. WHITE. Would the gentleman yield?

Mr. Secretary some time ago I asked the Treasury Department to strike some silver coins in the 10- and 25-cent denominations. I understand that the coins were made. I understand they are available. I would like to have them for examination at the same time you make the others available.

Secretary FOWLER. Yes, sir.

Mr. TODD. Mr. Secretary, I have one further question.

Following the chairman's comments earlier on the legal tender, would it be possible or legal to sign a contract which was payable in silver coins? In other words, if I owed you a thousand dollars, would it be an enforceable contract if you put in the contract the fact that I was to pay it to you in 50-cent silver pieces?

Secretary FOWLER. As far as I know—and I am advised by counsel, I am not practicing my own law these days—there is no law to prevent that.

Mr. TODD. Thank you.

The CHAIRMAN. Mr. Cabell?

Mr. CABELL. Thank you, Mr. Chairman.

Mr. Secretary, as soon as you reduce the silver content of the half dollar below its present value, any other reduction becomes a matter of degree—why not go on down to 20 percent or even 10 percent in this effort to conserve silver? You could probably take a 10-percent total silver content and, by reducing the thickness, could still provide the appearance that you are seeking, could you not?

Secretary FOWLER. I am told that there are technical limitations on how far down you can be in silver content without really changing very materially the appearance.

Now, it may be, as you indicate, this is a matter of some degree. I don't want to leave the impression that there is some very magical quality about the 40-percent fineness. However, I think there are limitations, and we have come out with that particular figure in terms of the quantity of production that is contemplated, and the quantity of silver that would be required for a fine appearing quality coin. If you reduced it to 20 percent—which would be quite marginal—you would be talking in production terms of utilization of around 7 to 8 million ounces of silver, as against 15.

Mr. CABELL. But your objective has been to reduce it as low as you thought appropriate.

Secretary FOWLER. Yes, sir.

Mr. CABELL. Inasmuch as you are asking for standby controls, why wouldn't it be wise to put those controls into immediate effect, particularly with reference to exportation of our present silver coinage, and then not wait until the horse is stolen before you start locking up the door?

Secretary FOWLER. Well, my experience has been in the case of controls such as these that sometimes they prove counterproductive when they are instituted; they move people more or less in the opposite direction.

Mr. CABELL. You don't think by any chance those who would have that kind of an idea would have to wait for those controls to be imposed to use or put those ideas into effect, do you? They are about two jumps ahead of you now.

Secretary FOWLER. All I know is that, during our various emergencies, sometimes a situation would be reasonably taut in an uncontrolled state, and when you announced or instituted the control it got much worse.

I think this is a marginal question, a marginal decision, that may well be a decision that we could take with reference to one coin but not another. But we did want to leave some room in the request to the Congress for the exercise of this judgment.

Mr. CABELL. I am thinking primarily of our present silver dollar, where once you announce that there is not going to be any more of them minted in the immediate future you are going to create a situation.

One further question, if I may.

You have in your Treasury stocks at the present time a very definite quantity of silver dollars, a number of which are definitely collectors' items that represent a small fortune. Is it the intent of the Treasury to keep those particular ones sterilized?

Secretary FOWLER. Yes, sir. There is no way for us to distribute them equitably. In this quantity, they would disappear; they would serve no useful purpose as a medium of exchange.

Mr. CABELL. Thank you very much, Mr. Secretary.

The CHAIRMAN. Mr. Hansen?

Mr. HANSEN. Thank you, Mr. Chairman.

Secretary Fowler, you have indicated you would not be resistant to an amendment to this measure that would call for a 5-year moratorium on silver dollar coinage. What would be your attitude toward a similar situation regarding the 50-cent piece so that you could get in motion on the more crucial needs?



Secretary FOWLER. Well, actually in our plans for production, Mr. Hansen, we do plan to put that at the end of the line in our production schedule. In other words, to build up the production of the quarter first, which is the area that we would like to have supplied in wholly adequate quantities and then move to the new dime. Then I think I said around the end of 1966 move toward the 50-cent piece in a quantity of production that would be adequate to justify its release on the market, avoiding the problems we had with the Kennedy half dollar.

I would naturally prefer to see Congress enact the President's program as he has recommended, which does include a production of the 50-cent piece in the fineness indicated, along the scheduled lines that I have indicated here in my testimony, so that we could move out in late 1966 or early 1967 with a production of the new half dollar and a distribution at the appropriate time when it was in quantity supply.

I think by this time the proposed Joint Commission on Coinage would be in existence; it would be in touch with the on-going problems that emerge as a result of the program and could see whether or not there is room and utility and desirability in our coinage system for that particular coin. I think, therefore, I would be personally opposed to any amendment that would have the effect of putting to one side the proposal with reference to the 50-cent piece.

Mr. HANSEN. One other question regarding the 50-cent piece.

Have people, your staff members made a study concerning the extent to which other nations are using a 50-cent piece that is made of a more base metal?

Secretary FOWLER. Yes, I think that information is available. I would like to supply it for the record.

(The information referred to follows:)

*Countries having a silver coin—varying finenesses*

Country	Denomination	Weight (grams)	Fineness (thousandths)
United States.....	Half dollar.....	12.5	900
France.....	5 francs.....	12.0	835
Germany, Federal Republic of.....	5 deutsche marks.....	11.2	625
Greece.....	20 drachmas.....	7.5	835
Italy.....	500 lire.....	11.0	835
Japan.....	100 yen.....	4.8	600

Secretary FOWLER. I think we can say that there are countries that do have a coin which utilizes some quantity of silver; a prestige coin, to use that word. The French, for example, have the 5 and 10 franc pieces. There are a number of other countries that use silver in at least one coin.

France, West Germany, and Italy are the ones that come readily to mind. They are following a system whereby they have abandoned silver for the lesser coins, but they have at least one coin containing silver.

Mr. HANSEN. One further point.

People called by the fancy name of numismatists—I call them collectors or hoarders—have in the last 5 years become extremely active. I happen to have one in my own family.

To what extent, in the judgment of your staff, do you folks believe that this proposed legislation is going to generate further activity on the part of these people?

Secretary FOWLER. Well, it is rather unpredictable to guess about the apparently increasing natural instinct we have to be collectors of one thing or another, which has a very pronounced impact on our coin supply.

We are neither anti nor pro coin collectors.

We have designed this program so that the impact on proper and legitimate coin collecting as such will not be subjected to any interference while at the same time that process will not impede or obstruct or interfere with the distribution and availability of an adequate quantity of the new coins so that the experiences that we have had, for example, with the Kennedy half dollar, would not be duplicated. We hope to avoid that in this program.

Mr. HANSEN. Mr. Secretary, I was thinking more in terms of the effect this whole affair would have on existing coins and whether or not you might find it necessary to put a little more toughness into the process you discuss here on page 12, under section 5, dealing with the melting and exporting and treating of silver coins, and whether or not you have given any thought to the question of taking an action similar to that which was taken back in the early thirties on gold.

Secretary FOWLER. We did consider the question in terms of what is called hoarding. That is a variant of the question, at least, that I think you are asking. And we considered that a prohibition against hoarding of coins defined in such a way as to make it an offense against the laws of the United States would be tremendously difficult to administer and doubtful of success.

We tried to work out a formula, just to try it on for size, of what one would define as hoarding, and we came up against these kinds of figures—that if 200 million Americans stashed away 10 coins, 2 billion would be removed from circulation. What is the normal supply for the variety of business establishments that are involved in our commerce today? Different types of stores have different needs. A chainstore operator versus the corner drugstore; a shoestore versus a 5 and 10.

So in establishing any guidelines or in advising Congress on how it should determine what would be an offense, or what boundaries the discretion the Secretary of the Treasury should have in issuing implementing regulations, you would run into quite a complicated network and would eventually be fraught with a lot of difficulty—a lot of hardship, exceptions and other great problems of administration.

In fact, when you are all done, there might be a net loss of coins in circulation because of only a little bit of hoarding by a majority of people, but if you really developed the fear of a shortage through the rigid enforcement of hoarding, you might really have a lot more coins taken out of active circulation by clearly legitimate commercial establishments simply as a hedge against shortages.

Mr. HANSEN. Thank you, Mr. Secretary.

The CHAIRMAN. Mr. Harvey.

Mr. HARVEY. Thank you very much, Mr. Chairman.

First of all, Mr. Secretary, let me apologize for my delay in being here this morning. I already had other plans I just could not change.

Secretary FOWLER. This was rather sudden.



Mr. HARVEY. I thought you might enjoy the remarks one of my friends made this morning, when I told him I was coming to hear your testimony. He said "I can sum it up—he is simply going to say 'heads I win, tails you lose.' "

Secretary FOWLER. I have felt many times in this decisionmaking process that the ways of decision were quite limited. It was a question of whether we were going to wrestle a bear or a tiger.

Mr. HARVEY. I only have one question, in the time I have had to look this over.

In section 5 you are authorized to make these rules and regulations. In section 16 it provides a pretty stiff penalty of \$10,000 or not more than 5 years in prison for any violation of any rules or regulations. So that what we really have is a case where we are setting a penalty for violations of unknown rules and regulations which are to be presented at an unknown future date, and in an unknown set of circumstances. It seems to me that is a pretty broad grant of authority.

Now, I know being a lawyer that you are—something like this must bother you.

Secretary FOWLER. I would be quite concerned, and that really is one of the reasons for the so-called standby use here. I think it would take quite a good deal of provocation in this area to come to a conclusion that one wished to invoke this kind of harsh authority which, if invoked, has to be enforced if it is going to be meaningful, which does raise questions of marginal cases where varying degrees of willfulness and intent appear.

However, I think what we are concerned with here is not a commonplace act that one might innocently without much thought be drawn into, such as might be the case if you had an antihoarding provision. Melting coins takes quite a bit of equipment and quite a good deal of—

Mr. HARVEY. That is my next question. I don't know if your General Counsel is here—maybe he would prefer to answer it rather than you. But are the words you are talking about here—exporting, melting, treating and so forth—capable of such definition that it restricts this authority?

Secretary FOWLER. I think so. I think that if it became necessary to issue these regulations, it would certainly be my intention to lean over backward in seeing that the regulations confined the acts that were subjected to the possibility of penalty to such clear and unmistakable actions that there would be no mistake about it.

Mr. HARVEY. Is there any danger, for example, of a coin collector falling into the category of treating coins in any way? I don't know—I ask that out of ignorance.

Secretary FOWLER. I certainly think insofar as the words "melting and treating" are concerned, the type and quantity of equipment that would be involved to melt down substantial quantities of coins and get the resulting silver in bullion form, that is something that could be pinned down. People would not accidentally fall into difficulty. There are lots of stories down in my part of the country about the Alcohol and Tobacco Tax Unit and innocent people doing a little moonshining on the side. I think everybody would know what he was doing in dealing with the melting and treating of a coin.

Now, the question of exporting coins of course does raise, I think, the question of what is the normal course of trade of a coin dealer who has customers abroad. This may be an important part of their business. I think we would have to consider the feasibility of provisions in such regulations to the end that the normal course of traffic between coin dealers and their customers abroad would not fall within the purview of these regulations.

Mr. HARVEY. I am asking this again—do you have to come back to Congress and this committee under any circumstances for approval of these regulations, or are you granted the outside authority to do that?

Secretary FOWLER. No, I think the authority here would be delegated without any such limitations. However, as the current Secretary, I certainly would be not only willing but anxious to have either informally or formally the views of the committee before taking this step. I think it would be a kind of a good testing, as it were, whether or not the regulations designed were in line with the intent of Congress in this area.

Mr. HARVEY. Thank you very much for your cooperation, Mr. Secretary.

The CHAIRMAN. Mr. Secretary, before we conclude these hearings—we are trying to finish by Tuesday if we can—I wonder if it would be too much of an imposition for you to appear here at 9:30 Monday morning.

Secretary FOWLER. Not at all.

The CHAIRMAN. Thank you, sir. We cannot possibly have a meeting in the afternoon because we may have a bill on the House floor and the committee members must be there. So we will meet at 9:30 Monday morning.

Mr. Moorhead, do you have a question?

Mr. MOORHEAD. Yes, Mr. Chairman—just one question.

Mr. Secretary, can you tell us what is the purpose and what do you think would be the effect of section 7, providing for a \$1.25 floor on the price of silver?

Secretary FOWLER. The purpose of it was to provide against the contingency that this particular program, if announced and adopted, should prove to be disruptive to the silver-producing region because of a sharp drop in the price of silver. I, for one, do not anticipate this but there are those that believe by enacting the legislation proposed, that there would be a sharp change in the attitudes of buyers and in the price of silver. This would disrupt production and create an undesirable impact in a given region of the country. We therefore felt it would be wise to have this authority in the act to avert any possible unnecessary hardship.

We have of necessity to ask for a ceiling in another section of the law in order to protect the existing coinage, silver coins that are in circulation, as indicated. And we felt having requested the right to maintain a ceiling, we ought logically to ask for the right to maintain a floor.

Mr. MOORHEAD. One other question, sir.

Is the coin vending machine industry satisfied with the proposals contained in this bill?

Secretary FOWLER. They will of course speak for themselves, but it is my understanding from press dispatches that I have had an oppor-



tunity to review since the message came out that the organized association that speaks for this segment of the industry has expressed hearty approval and accord with the proposal.

Mr. MOORHEAD. Thank you, Mr. Secretary.

The CHAIRMAN. Mr. Ashley.

Mr. ASHLEY. Mr. Secretary, just a final question or two with respect to the 50-cent piece and one or two other matters.

Is it your notion that the prestige of a coin is represented by the amount of silver that is contained in the coin?

Secretary FOWLER. No. I think that this is something of a psychological matter, linked with this 173-year-old tradition. Having a silver coin would lend an element of prestige.

I think the appearance of the new silver half dollar, from the samples and tests that we have made, is very attractive.

Mr. ASHLEY. At what point would the appearance of the 50-cent piece change? You are proposing a reduction in the amount of silver to 40 percent. Where did the 40-percent figure come from? Why not 20 percent?

Secretary FOWLER. It is a very technical question. We are relying here on technical advice. I think some of the reports that are available to you perhaps can answer it better than I can. But I am told that the appearance of the coin changes very markedly as you move down from the 40 percent silver toward, let us say, 20 or 15 percent. When you reach that particular area, then it becomes quite different.

Mr. WHITE. Will the gentleman yield at that point?

Mr. ASHLEY. Yes.

Mr. WHITE. Isn't it true that the appearance of the 50-cent piece is very similar to the present 50-cent piece, and the reason for that appearance is because it is a layered coin with an 80-percent silver exterior?

Secretary FOWLER. That's right.

Mr. WHITE. Isn't it also true that the two coins are almost indistinguishable?

Secretary FOWLER. That's correct.

Mr. WHITE. And this was a mechanical——

Secretary FOWLER. So that the layer—you might say two pieces of bread—has about an 80-percent content of silver, and therefore resembles the present coin so that they are really almost indistinguishable.

Mr. ASHLEY. I am curious—and I don't suppose we are going to get any further clarification with respect to the fact that what is being proposed is a dual system of coins, really—one nonprestige, utilitarian coins, of the nickel, dime, and quarter, all essentially the same content, at least in terms of silver.

Secretary FOWLER. Right.

Mr. ASHLEY. Then for some reason I still cannot understand, we decide that it is necessary, regardless of this severe shortage, the critical shortage of silver to which you have testified, to have a 50-cent-piece coin that it seems to me flies in the face of all the testimony you have presented.

Secretary FOWLER. Well, I don't know if I used "necessary." I think it is desirable to have the 50-cent piece along the lines recommended as a continuing part of our coinage system. And this is in deference, as I have indicated to some extent, to tradition which is

not to be ignored in these matters. It is in deference to the desire of many people for a coin of appearance that contains silver, which has been and always will be the most attractive metal from the standpoint of appearance. I don't think there is anything like the law of the Medes and the Persians that work in this particular aspect of our decision. I think it is a debatable one. We debated it quite at length and finally came down on the side that the availability and utilization of this 50-cent piece, after the initial period of transition to the new coinage, was worth the dedication out of our available stocks of approximately 15 million ounces or less a year for that purpose.

Now, we knew that it would be a somewhat controversial recommendation from the standpoint of silver users who do not want 1 ounce of silver to be used in coinage. I have said to some of these gentlemen frankly, that the answer to their problem, whether it is this year or next year or 10 years from now or 15 years from now, is not going to lie in whether or not we continue to use 15 million ounces of silver a year for coinage; it is going to lie in technological changes and adaptation.

Mr. ASHLEY. All right, Mr Secretary. I just think your case would have been more cleanly presented had you come in with the same recommendation with respect to all the coins.

Seigniorage, Mr. Secretary, as I understand it, is the profit represented by the difference in the cost of production of coins and the face value of those coins. In the first 9 months of the last fiscal year, this profit amounted to some \$57 million, and up to April 30 of this year it is running at \$87 million, according to the latest monthly summary of Federal cash transactions. This would be attributable to the big increase in coin production this year.

With the introduction of these new coins, for which the ingredients or materials will be considerably less in cost, I gather that the seigniorage will be sharply increased.

Secretary FOWLER. It will be a very profitable operation. But, of course, that is not the reason for the recommended changes.

Mr. ASHLEY. Can you give us—of course any forecast that you would have would depend upon the rate at which the new coins are to be introduced. Is there any plan or schedule that would reflect the rate and volume at which the various new coins would be introduced?

Secretary FOWLER. I think we can supply you that, Congressman Ashley, for the record. I do have some figures here.

Mr. ASHLEY. For the record it would be fine.

Secretary FOWLER. Since it is a technical question I think supplying it for the record would be more satisfactory.

(The information referred to follows:)

*Estimated production of new alloy coins, fiscal year 1966*

[In millions of pieces]

	10-cent	25-cent	50-cent	Total
July to December 1965.....		535		535
January to June 1966.....	1,430	1,880		3,310
Total.....	1,430	2,415		3,845



Five hundred and thirty-five million new quarters will be released in early 1966. The new dimes will be available for release sometime in mid-1966.

Production of the new half dollar will be deferred until fiscal 1967, and will be released when sufficient quantities are on hand. While a definite production program has not been developed for fiscal 1967, the mint will be in a position to meet any foreseeable demand placed on it.

Mr. ASHLEY. Thank you very much. I must say, as others have said, it is a great pleasure to have you here. You make an extremely lucid and persuasive witness. I must say that I commend you particularly because you have not been in office too long—it seems to me the grasp of the subject matter which you reflect is very, very reassuring.

Secretary FOWLER. Thank you. There have been a few other things to think about as well as coinage.

The CHAIRMAN. Mr. Fowler, I don't want to take up any more time, but I feel we should have this in the record.

I notice at page 13 of your booklet on the "Treasury Staff Study of Silver and Coinage" you have this table 4, "Estimated U.S. Silver Consumption by Field of Use for End Product, 1959 to 1964," and you show there the different purposes for which this silver was used, like batteries and alloys, medical uses, and so forth, aggregating 127 million fine troy ounces, in 1964. It was less than that in 1963, less in 1962, less in 1961, less in 1960, and even less in 1959. So it has increased every year—127 million fine troy ounces.

Now, out of that there is 40.3 million fine troy ounces that are used for photographic film plates and sensitized paper.

Is it your understanding that an effort is being made now to substitute something for these purposes where the use of silver will not be required?

Secretary FOWLER. There is, I am told, a good deal of scientific effort going on by some of the outstanding firms in this particular field. I am not in a position to appraise the possibilities of breakthroughs in this particular area, but certainly with the pressures that are on the supply of silver and with the problems ahead I would hazard a judgment that this kind of effort, to find suitable substitute materials, is likely to be substantially intensified, and of course it would become a very crucial thing when and if any decision were made by the U.S. Government to go out of this silver field.

Mr. WHITE. Mr. Chairman, would you yield at that point?

The CHAIRMAN. Yes.

Mr. WHITE. I believe there is one other piece of information that should be added there. Is there not quite an effort being made in the recovery area of silver from hypo solutions?

Secretary FOWLER. Yes. The research is along two lines—substitute materials and reclaiming and recovery.

Mr. WHITE. And there is a possibility of a greater degree of recovery than they are now exercising.

Secretary FOWLER. Yes, sir.

The CHAIRMAN. Well, thank you very much, Mr. Secretary, and also the gentleman accompanying you. We dislike asking you to come back Monday morning, but we would like to get this bill voted out Tuesday if we can.

Secretary FOWLER. You want me to be here at 9 o'clock, Mr. Chairman?

The CHAIRMAN. 9:30 will be fine.

Secretary FOWLER. Thank you, sir.

The CHAIRMAN. Thank you very much, Mr. Secretary.

The committee will stand in recess until 9:30 Monday morning.  
(The following information was submitted for the record:)

ANSWER TO QUESTIONS SUBMITTED BY MR. PATMAN TO SECRETARY FOWLER

Questions. Assuming you have considered the silver extraction industry in your deliberations, what do you feel the effect of this legislation will be on this industry?

How will the employment situation and the silver mining be changed, and will the mine owners still have enough economic incentive to continue in business?

Answer. The Treasury Department in its extensive study and deliberations of the silver and coinage problems has made every effort to consider all of the consequences which would arise from its legislative proposals. One specific requirement of the new coinage program was that it should not inflict undue hardship on any group, or sector of the economy. The present legislation meets that requirement and will not inflict undue hardship on any group or sector of the economy, including the silver producers. Section 7 of the draft legislation authorizes the Secretary of the Treasury to purchase silver mined in the United States, provided it is tendered within 1 year, at the price of \$1.25 per fine troy ounce. If enacted, this provision would offer silver producers an insurance against price declines which they do not have at present. Silver producers have, of course, already benefited from the 42-percent increase in silver prices that occurred between 1961 and 1963.

It is not anticipated that enactment of the Treasury's legislative proposals would be likely to cause any sustained decline in the price of silver. However, it is possible that the liquidation of speculative stocks of silver in an unsupported market could cause silver prices to fall temporarily; and it would seem appropriate to shield domestic producers from the full impact of any sharp fall in price, if contrary to expectation, such were to occur. It should also be noted that under section 6 of the proposed legislation the Secretary of the Treasury is authorized to sell silver not required to back silver certificates, but at a price not less than the monetary value of silver. Hence, domestic silver producers are assured that any sales of Treasury silver will not depress market price.

In regard to the legislation's effect on employment at silver mines, the Treasury anticipates very little or no effect at all. In 1963, approximately 4,100 persons were employed in the silver and gold-silver mining industry. These employment figures refer only to those mines primarily producing silver-bearing ores and do not include employment at base metal mines, such as copper, lead, and zinc, which are responsible for producing about two-thirds of the domestic silver output in any given year. Of the five major silver-producing States, only Idaho, which obtains about 60 percent of its total recoverable silver from silver ores, is significantly dependent upon pure silver mining for output and employment. In the other States, silver is largely obtained as a byproduct with other ores, and in these other States employment depends mostly upon the price and demand for other base ores, not silver. In any event, as described above, the legislation contains specific safeguards against any sharp fall in the price of silver. In view of the large and growing demand for silver and the assurance of relatively stable prices, the position of the silver mining industry should be a favorable one.

For these reasons, the Treasury considers that the current legislation will have little or no adverse effects relating to employment or economic incentives of the silver producers.

(Whereupon, at 12:30 p.m., the committee adjourned, to reconvene at 9:30 a.m., Monday, June 7, 1965.)



## COINAGE ACT OF 1965

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MONDAY, JUNE 7, 1965

HOUSE OF REPRESENTATIVES,  
COMMITTEE ON BANKING AND CURRENCY,  
*Washington, D.C.*

The committee met, pursuant to recess, at 9:30 a.m., in room 2128, Rayburn House Office Building, Hon. Wright Patman (chairman) presiding.

Present: Representatives Patman, Barrett, Mrs. Sullivan, Reuss, Ashley, Moorhead, Gonzalez, Hanna, Grabowski, White, Gettys, Todd, Cabell, McGrath, Hansen, Widnall, Fino, Stanton, and Mize.

The CHAIRMAN. The committee will please come to order. Mrs. Sullivan?

Mrs. SULLIVAN. Mr. Chairman, although I am a day late in doing so, I want to welcome the Secretary in his appearance before the committee on a matter of great interest to the Subcommittee on Consumer Affairs, which has jurisdiction over coinage legislation in the committee. I might say that Chairman Patman and I discussed on numerous occasions this year the procedures to be followed when the administration finally made its report to us on its 2-year study in this matter, and we agreed that the subject was of such nature that full committee hearings were advisable. So I don't want anyone to think that we were bypassed.

I am only sorry, however, Mr. Chairman, that after waiting so long for this report—having had it promised to us first in February and then April—that when it finally did come up it was on such short notice that I had already gone to Omaha for hearings on Thursday, Friday, and Saturday of the National Commission on Food Marketing—the only out-of-town hearings of the Commission I have been able to attend.

These are the hazards, I suppose, of ever leaving Washington on any official assignment.

Since I could not attend the hearing Friday, I am grateful to the Chairman for arranging this opportunity for those of us who were necessarily absent Friday to question the Secretary this morning. And when my turn comes for questioning, I do have some questions.

The CHAIRMAN. I will place in the record at this point a telegram from Carl Millman, president of Automatic Merchandising Corp., endorsing the new coinage bill; also a statement from the Silver Users Association endorsing parts of the bill; and a similar statement from the National Association of Photographic Manufacturers, Inc., New York, and one from Thomas B. Hungerford, executive director of the National Automatic Merchandising Association, endorsing the bill.

(The documents referred to follow:)

MILWAUKEE, WIS.,  
June 4, 1965.

Hon. WRIGHT PATMAN,  
*House of Representatives,*  
*Washington, D.C.:*

Strongly endorse the new coinage proposed by the President. No other new coins will work properly in our machines causing public confusion and irritation. Request you support this proposal since the welfare of our employees and our customers is dependent upon passage of this bill.

CARL MILLMAN,  
*President, Automatic Merchandising Corp.*

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SILVER USERS ASSOCIATION,  
June 3, 1965.

#### STATEMENT ON THE PRESIDENT'S COINAGE MESSAGE

Commenting on proposed legislation submitted to Congress concerning the metallic composition of U.S. subsidiary coins, John B. Stevens, chairman of the executive committee, Silver Users Association, stated:

"The Silver Users Association endorses the action taken by the administration in recommending the minting of dimes and quarters without silver.

"The association strongly opposes the recommendation calling for a half dollar with a 40-percent silver content. Based on the number of these coins minted last year, this new coin would consume approximately 33 million ounces of silver, an amount which is almost equal to the entire U.S. annual production.

"Only last week the administration reversed its 9-day-old decision to mint silver dollars because it was concluded they would immediately disappear into the hands of speculators and would waste 35 million ounces of silver.

"A silver clad coin, unique in monetary systems, would also disappear as fast as minted, for it too would be another collector's item.

"No purpose would be served by the use of silver in this coin other than to use up Treasury stocks of silver and ultimately force the Treasury into the silver market where there is even now a 25 percent deficit between production and consumption.

"Speculative interest in silver will be increased and will result in even greater hoarding of present silver coins at a time when mint facilities will be strained to the utmost in the production of new quarters and dimes, as well as other coins.

"Every ounce of silver used up in a silver-clad coin would be at the expense of the industrial users of silver and the consuming public. Retention of silver in the half dollar would again provide a vehicle for a price rise for the benefit of silver-producing interests. It is unbelievable that the administration should propose a new coin made of a material which is already in short supply in the market."

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#### NATIONAL ASSOCIATION OF PHOTOGRAPHIC MANUFACTURERS, INC.

The U.S. photographic manufacturers approve the President's legislative proposals for the elimination of silver from dimes and quarters, but are concerned about the retention of silver in the half dollar.

Arthur W. Taber, chairman of the Silver Committee of the National Association of Photographic Manufacturers, Inc., and vice president-secretary of Peerless Photo Products, Inc., expressed the concern of the industry that the retention of any silver in coinage will only aggravate the existing shortage of this precious metal in the market.

Silver is vital in photography and the possible effect of this action will affect broad segments of the American economy using photographic products, especially the printing industry, the use of medical X-rays, the graphic arts field, and the Government itself.



## STATEMENT BY THOMAS B. HUNGERFORD, EXECUTIVE DIRECTOR OF THE NATIONAL AUTOMATIC MERCHANDISING ASSOCIATION

The vending industry wholeheartedly supports the U.S. Treasury bill on coinage and commends the administration for this practical and imaginative solution to the problem of diminishing silver reserves.

Because the proposed coins will work reliably in present vending machines, they will be welcomed by the millions of American consumers who increasingly depend on coin-operated equipment for goods and services 24 hours a day.

The new coins have been thoroughly tested in existing coin mechanisms and will work side by side with present coins in all coin-operated devices. This is a critical requirement for more than half of the 12 million coin units now in operation throughout the country.

From the 1.5 million Americans who obtain at least one meal a day from vending machines to the young housewife who depends on the neighborhood laundromat, coin-operated services are a vital part of the modern economy. More than 30 billion coins are used by Americans annually in merchandise vending machines alone.

The distinctive appearance of the new coins offers greater protection against counterfeiting and the abundance of the new coin metal will assure an ample coin supply in the future for all retail businesses.

The vending industry urges passage of the bill because it provides an ideal solution to the crucial coinage problem and assures an adequate and modern coin supply for the American economy in the years ahead.

The CHAIRMAN. I have an unusual letter here which I think I will read and then place in the record. It is from Hawaii.

"It seems to me the most economical way to conserve silver would be to discontinue the coinage of the half dollar entirely. Half dollars are a nuisance. They are too much for the average tip. They cannot be used in coin telephones. They are too large for most vending machines. I would suggest, first, elimination of the half dollar. Then after testing the effect, consideration might be given to reducing the silver content of other coins, if this should still seem necessary.

"Mr. John T. Harcourt."

(The letter follows:)

HONOLULU, HAWAII, *June 4, 1965.*

HON. WRIGHT PATMAN,  
*House of Representatives,*  
*Washington, D.C.*

DEAR MR. PATMAN: It seems to me that the most economical way to conserve silver would be to discontinue the coinage of half dollars entirely.

Half dollars are a nuisance. They are too much for the average tip. They cannot be used in coin telephones. They are too large for most vending machines.

I would suggest, first, eliminate the half dollar. Then, after testing the effect, consideration might be given to reducing the silver content of other coins, if this should still seem necessary.

Sincerely yours,

JOHN T. HARCOURT.

Mrs. SULLIVAN. Mr. Chairman, while we are inserting material in the record, may I ask if you have the President's message of last Thursday included in the record?

The CHAIRMAN. Yes; immediately following the bill in the first part of the proceedings.

Mrs. SULLIVAN. Then I wanted to ask permission to have the "Treasury Staff Study of Silver and Coinage" also inserted in the record, and the Battelle Report also. It just seems to me——

The CHAIRMAN. Suppose we make that available to the members of the committee, and then we will have the staff select the portions that should go in. I doubt that we should put the entire study in. Would you want it in?

Mrs. SULLIVAN. Yes, sir; I believe the Treasury staff study and the Battelle Memorial Institute technical report are of such long-range interest and importance to all who are interested in the subject of our coins and coinage—and that includes most Americans—that our printed hearings on this historic change in our coins should include these valuable background materials.

The CHAIRMAN. It covers the subject thoroughly. Let's put it in. We will put it in the appendix.

Now, the members who were not here the other day I think should be given first consideration. Mr. Barrett, and Mrs. Sullivan, Mr. Reuss, and Mr. Cabell. Mr. Barrett?

Mr. BARRETT. Mr. Chairman, I will pass my opportunity to question at the present time to Mrs. Sullivan.

The CHAIRMAN. Mrs. Sullivan?

Mrs. SULLIVAN. I understand that on Friday the Secretary was asked by Mr. Moorhead if the proposed solutions to our silver and coin problems contained in this legislation were satisfactory to the vending machine industry, and he replied that he believed they were. Since we apparently will not be calling witnesses from the industry, I think it might be useful to have at this point in the record, with the committee's permission, several communications I have received over the weekend from two firms in St. Louis which are leaders in this industry: the Universal Match Co., one of the biggest, and its subsidiary, National Rejectors, Inc., which makes the sensor mechanisms which measure the weight, size, and electrical resistance and conductivity of coins.

These communications give clear evidence of the fact that the Treasury has devised a solution satisfactory to that industry—and I believe every congressional office received numerous wires, letters and telephone calls from the vending machine companies expressing concern on this point before the report was made public.

The CHAIRMAN. Without objection, they will be placed in the record at this point.

(The documents referred to follow:)

UNIVERSAL MATCH CORP.,  
St. Louis, Mo., June 4, 1965.

HON. LEONOR K. SULLIVAN,  
Banking and Currency Committee,  
House of Representatives, Washington, D.C.:

Universal Match Corp. strongly endorses the new coins proposed by President Johnson as contained in his message yesterday. The new coins will work side by side with present silver coins and will require no adjustment to present vending machine mechanisms for coins. Present coins will be in use for a long time and it is very important that both types work in the millions of vending machines now in use by the American public. Failure of the Congress to adopt the coins proposed by the President would lead to great economic loss since there would be wide confusion on the part of the public using the machines, and it would be necessary to make costly changes in all vending machines which could lead to chaos in this very important segment of the American economy as you know, we are one of the leading manufacturers of automatic vending machines and the world's largest producer of coin mechanisms for vending machines. As such, we employ directly approximately 2,500 people in the vending machine manufacturing operations and coin mechanisms for vending machines. These manufacturing facilities, located primarily in the State of Missouri, are a major factor in keeping Missouri in the forefront of this growing and necessary industry. We trust that you will give prime and favorable consideration to the approval of the President's recommendation.



You have been instrumental in helping our industry in the past and we are most grateful.

THOMAS B. DONAHUE,  
*President and Chief Executive Officer.*

NATIONAL REJECTORS, INC.,  
*June 5, 1965.*

HON. LEONOR K. SULLIVAN,  
*House of Representatives, Washington, D.C.:*

As manufacturers of coin handling equipment for use in vending machines, we have been greatly interested in and vitally concerned with the recommendation of the Treasury Department with regard to new coinage material. We realize that in your position as chairman of the subcommittee of the Committee on Banking and Currency, you are also greatly interested in the present coinage proposal. We are in complete accord with the recommendation by the Treasury Department of the so-called sandwich coin material, since it will not only be accepted side by side with present coins in all vending machines and other coin-operated devices, but will be accepted without any complicated or costly adjustments to coin handling equipment. National Rejectors, Inc., has conducted thorough tests of various metals and alloys proposed as new coinage material, but the material, as recommended in the Treasury Department proposal, is the one which is properly and reliably accepted. Since you were successful in sponsoring the antislug law several years ago, we are respectfully urging that you also support and vote for the Treasury proposal for new coins. Thank you.

ERIC SOKOL,  
*Executive Vice President.*

The CHAIRMAN. They are favorable to the bill?

Mrs. SULLIVAN. Yes, completely so.

**STATEMENT OF HON. HENRY H. FOWLER, SECRETARY OF THE  
TREASURY; ACCOMPANIED BY ROBERT A. WALLACE, ASSIST-  
ANT SECRETARY; FRED B. SMITH, ACTING GENERAL COUNSEL;  
EVA ADAMS, DIRECTOR OF THE MINT; FREDERICK W. TATE,  
DEPUTY DIRECTOR OF THE MINT; AND JOHN H. AUTEN,  
DEPUTY DIRECTOR, OFFICE OF FINANCIAL ANALYSIS—  
Resumed**

Mrs. SULLIVAN. Now, Mr. Secretary, I note the great concern the Treasury demonstrated in coming up with a solution for having coins compatible in the existing vending machines. But perhaps not all of the members know why this is so important from a Federal criminal enforcement standpoint. I am afraid I had a lot to do with that in the sponsorship of Public Law 87-667, 3 years ago, the slug law, which makes it a Federal crime to use slugs of any denomination in an "automatic merchandise vending machine, postage stamp machine, turnstile, fare box, coinbox, telephone, parking meter," and so forth.

Formerly it was a Federal crime only if it involved a 1-, 2-, 3-, or 5-cent piece.

So perhaps it might be helpful to tell the committee the extent of the law enforcement problem Uncle Sam would have had if the Treasury had not devised a new coin material with properties similar to silver, so that electrical resistivity tests in the vending machines could continue to reject the slugs easily.

So this is, therefore, not just a matter of convenience to the vending machine industry, is it?

Secretary FOWLER. No. It is a matter that really goes to the value of a coin as a medium of exchange, from the standpoint of the classic and traditional value. If the development of merchandising techniques promises to continue to employ these various vending-machine devices in a much greater degree—if the curve of utilization continues to go up as it has in recent years—it seems to me that it is not only appropriate, but necessary, for the Congress and the Treasury, who are concerned with providing the type of coinage that will serve the purpose of a medium of exchange in the modern world in which we live, to try to adapt any new coin to the merchandising conditions which surround us. Our coinage proposal is made not with particular regard to any given group of manufacturers nor with regard to any given group of distributors who utilize the vending machine in their establishment, but because of the public interest and the public necessity in many cases to resort to these vending devices, and the inconvenience to the public that would be involved in developing coins that would not be compatible and would not add to the law and tradition and good manners and general honesty, and so forth, under the safeguard that the present machines provide in the technique which you have referred to of resisting slugs and coins other than the ones that are normally employed.

So looking at it from the overall standpoint of what is necessary for the trade and commerce of the country, it seemed to us that we should search for a substitute coin for the silver coin that would be as close to compatible with the silver coin, and thereby make possible the continued utilization and continued development of this method of distribution. It was in that spirit and that attitude that Treasury came down, you might say, for the particular coins that are recommended to the committee now. Otherwise, I think we would have had a long period of disruption of the utilization of the current devices; we might have had a period of doubt as to whether or not this particular form of distribution could continue to develop in line with the needs of commerce, and it would have been a period of disruption that would have caused us all great difficulty.

Mrs. SULLIVAN. Thank you. Mr. Secretary, I would like to pursue the proposal in the bill for a Joint Commission. I notice that you specify as members in addition to the Secretary of Treasury as Chairman, which is appropriate, the Secretary of Commerce, the Director of the Bureau of the Budget, the Director of the Mint, along with the chairmen and ranking minority members of the House and Senate Banking and Currency Committees, one other member from each House to be appointed by the Speaker and President of the Senate, and four public members appointed by the President.

In Commissions of this nature, with Cabinet officers and other high governmental officials serving, I believe the Cabinet officer often assigns the responsibility to an assistant when he cannot personally be present at a meeting.

Would a similar flexibility be given to the congressional members? Could Mr. Patman or Mr. Widnall assign another member to attend a meeting in his place, or is it your intention that only the principals will actually participate, not assistant secretaries or assistant directors and so on?

Secretary FOWLER. I would think, Mrs. Sullivan, that the ground rules of the operation of the Commission probably ought to be de-



terminated by the Commission itself when it meets and convenes. A certain amount of flexibility must necessarily be retained insofar as participation in meetings are concerned. I think we all recognize as a practical matter the tremendous demands for time that are placed on both my office and the Director of the Budget and the chairmen of the respective committees.

Certainly if I were serving on such a Commission and asked to advise, I would think I would come out with saying that we would hope the principals could be in attendance a good part of the time, but whenever it was not convenient for them to be there, they could be represented by an alternate.

By the same token, I think it would also be wise to have an alternate available and familiar with the on-going work of the Commission so that there would be the continuity that would be necessary.

There might be rare occasions in which it would be desirable from the standpoint of the Commission to exclude staff from the room and exclude alternates, and just for the members of the Commission themselves to deliberate and act. But I would hope when the Commission was set up and in operation, that not only the Secretary and the Director of the Mint, but also the Assistant Secretary, who is the channel from the Secretary's Office to the Mint, various staff members of the staff of the Mint and members of our Office of Financial Analysis could be available for the convenience and service of the Commission.

Now, it goes without saying, therefore, the chairman and ranking minority member of the Banking and Currency Committee ought to have alternates that they could call on to attend and participate in the sessions.

Mrs. SULLIVAN. Well, it just seemed to me that this should be spelled out somewhere, either in these hearings or in the formation of the Commission, so that the ground rules were set. I raised this question because I know how busy all of the principals are in their official responsibilities and because of the common practice in the Government of assigning assistants or alternates to such commission meetings.

Secretary FOWLER. I would think that would be very appropriate—and perhaps some comments in the committee report might clarify everyone's intention in that regard.

Mrs. SULLIVAN. Thank you. My time is up.

The CHAIRMAN. Mr. Reuss?

Mr. REUSS. Thank you, Mr. Chairman.

I want to congratulate you and your associates, Mr. Secretary, on a very progressive coinage program here. The logic of removing the silver from the dime and the quarter, I think, is inescapable. But I am so impressed with your logic I wondered why you did not apply it to the half dollar.

How much would it cost the Treasury and the taxpayers to keep 40 percent silver in the half dollar, based on anticipated use?

Secretary FOWLER. I think perhaps the major cost element to be considered is the cost in the stocks of silver themselves. I imagine that is your primary concern.

Mr. REUSS. May I ask first, what will the new cupronickel quarter cost? I know it is practically nothing. But what is it?

Secretary FOWLER. Just one moment, sir. In terms of a thousand dollars of face value of quarters, the cost would be \$58.61.

Mr. REUSS. That is the new quarters?

Secretary FOWLER. That is the new quarter.

Mr. REUSS. Now, how about a thousand dollars worth of——

Secretary FOWLER. Of the old quarters?

Mr. REUSS. Well, let's have the old quarters, and then——

Secretary FOWLER. A thousand dollars worth of the old quarters would cost \$935.27.

Mr. REUSS. Congratulations. This is turning off the lights with a vengeance.

Now let's have this on the four-bits.

Secretary FOWLER. Right. Now, the old 50-cent piece——

Mr. REUSS. That is 90 percent silver.

Secretary FOWLER. Right. \$935.27 is the cost of the metal in the old 50-cent piece—a thousand dollars worth of 50-cent pieces contain \$935 of silver.

Mr. REUSS. The present quarter and the present 50-cent piece are both 90 percent silver?

Secretary FOWLER. That is right.

Mr. REUSS. And how about the new?

Secretary FOWLER. The new one would be \$432.37.

Mr. REUSS. Well, I have a bright idea for saving you \$400 on every thousand. Why don't we do that? Why don't we make a cupronickel 50-cent piece, in order to achieve multimillion-dollar economies? I guess before I pursue this I should ask you the anticipated use or coinage of 50-cent pieces, per year.

Secretary FOWLER. I think our contemplated production schedule for the new 50-cent piece would be about 100 million a year. That would be a high figure.

Mr. REUSS. A hundred million a year. Has somebody done the arithmetic?

Secretary FOWLER. We have done it in terms of the silver. You see, our primary concern, Congressman, was arriving at the type and kind of coinage that we thought would meet the coinage needs of the country. This profit on seigniorage and the cost of metal as it were is an incidental benefit that is achieved, not as a primary purpose of this program.

Mr. REUSS. Right. But any time you can get incidental benefits which will work out at about \$400, times 100,000, as I compute it, it seems an incident worth groping for.

Secretary FOWLER. It is a useful figure for the record.

Mr. REUSS. I make it that the use of a cupronickel half dollar in the future, such as the proposed cupronickel dime and quarter, would save about \$40 million a year to the taxpayers of the United States over the proposal to use a 40-percent silver half dollar.

Secretary FOWLER. Your slide rule is working faster than mine.

Mr. REUSS. It may not be working at all.

Secretary FOWLER. I think that is what the mathematics may work out to.

Mr. REUSS. If my \$40 million estimate is grievously in error——

Secretary FOWLER. We will correct it for the record; yes, sir.

(The information follows:)



*Savings in seigniorage of cupronickel half dollars over silver clad half dollars*

Cost of metal in \$1,000 face value of silver clad half dollar-----	\$432. 37
Cost of metal in \$1,000 face value of cupronickel clad half dollar-----	58. 61
Difference-----	373. 76

100,000,000 half dollars=\$50,000,000 face value.

\$50,000,000 face value at a savings of \$373.76 per \$1,000 face value=a savings of \$18,688,000.

Mr. REUSS. I make, then, as point 1, that though the saving be incidental, \$40 million isn't hay.

Point No. 2, I note that already 50-cent pieces are, I believe, next to silver dollars, the shortest item in our coinage offering, are they not?

Secretary FOWLER. That is right.

Mr. REUSS. Aren't they about the scarcest?

Secretary FOWLER. That is right.

Mr. REUSS. Well, isn't some sort of perverse Gresham's law likely to operate whereby a lot of people who should know better but don't are going to be a little leery of the new dimes and quarters and think that this new half dollar is the one that still has 40 percent silver in it, and isn't there going to be a tendency to take those off the market by hoarding, and require the Treasury to coin more of them than anticipated?

Secretary FOWLER. Certainly insofar as I suppose those who buy coins for their grandchildren and want them as family gifts there will be some withdrawal of the 50-cent piece. Certainly we have witnessed that in connection with the John F. Kennedy half dollar. They are used as gifts and held more or less out of the mainstream of commerce.

However, if the new half dollars are made and released in the quantities anticipated—in terms of the quantity production that we have in mind—I believe their attractiveness for coin collection, amateur as well as professional, will be less. And while certainly you are quite correct in saying that there would be more of a tendency to take a new 50-cent piece and to hold it than it would the new quarter or the new dime, I would hope that the differences would not be too appreciable over a period of time as it became a rather commonplace element in our coin system.

Mr. REUSS. Let me ask this question: In view of the indicated saving to the Treasury, would the executive branch have any objection if Congress should deem it wise to amend and improve and perfect the legislation before us by treating half dollars on the same basis as it is proposed to treat dimes and quarters?

Secretary FOWLER. Yes; the answer to that is "Yes." We have thought a good deal about this. We don't have any feeling certainly of infallible judgment in this matter. But we did come to the conclusion that the new 50-cent piece would maintain a link in our coinage with traditional metal that we have come to accept as traditional. It would provide—although there was some concern about the use of the term the other day—a prestige coin. This is something that other countries that have left silver seem to do. I don't mean that we are just keeping up with the Joneses in this regard. But many of the Western European countries that have now gone to baser metals than silver for their subsidiary coinage, do retain a particular coin with either 400 or 500 fineness of silver to keep some link.

And while I don't want to represent that the case is such a solid one that it is not open to question or judgment—I think obviously it is a matter for the Congress to decide—it is our positive recommendation—and we feel it is important certainly for the time being—to maintain this link and to try, over a period of time, to see if the new silver 40-percent fineness 50-cent piece cannot come to occupy a very real place in our coinage system.

Now, I would be reasonably sure, Congressman Reuss, that the topic we are discussing here today is probably going to be a topic that the Joint Commission would have to consider after a period of 3 years, when the new coinage system is working, when there has been an opportunity to appraise the coinage problem in the context of the overall supply-demand situation for silver, in what I would hope to be a more normal frame of reference than the current situation where we are all concerned with the first and the primary step of moving out from a complete dependence upon a metal which doesn't promise to be in adequate supply.

I think actually this question will be debated during these hearings. We certainly anticipated that it would be. And that the resolution of the Congress in this particular bill may not be the last word on it, if it follows the administration proposal. But I think it is an effort that is worth a trial until we see a little more clearly what the long-term future of silver may be.

Mr. REUSS. Thank you, Mr. Secretary.

The CHAIRMAN. In announcing the members who have not interrogated witnesses, I made an error by indicating Mr. Cabell—I should have said Mr. McGrath.

When Mr. McGrath is finished, we will start all over again and give each member an opportunity.

And we must note the appearance at this time of Miss Eva Adams, Director of the Mint. She was unavoidably detained Friday, because she had other official duties that prevented her attendance. Any others who were not here?

Secretary FOWLER. I believe that is all.

Mr. WALLACE. Mr. Chairman, I wonder if I could add just something to what Secretary Fowler said about the half dollar, because I think it is a very important part.

In working out the program, we had to take into account preservation of existing coins. Now, there are three types of possible hoarding. One is hoarding of coins for the silver content. We believe that the program will prevent that by maintaining the price of silver at \$1.29, and also by having standby authority to prohibit the melting or export of coins.

The second type of hoarding is the numismatic, or speculator, who buys coins in quantities in the hopes of increasing values. The fact that we have nearly 12 billion of these coins in circulation will make them anything but rare, which we think will take care of that problem.

The third type of hoarding is much more difficult to tackle.

Mr. ASHLEY. 12 billion 50 cent pieces?

Mr. WALLACE. No; 12 billion total silver coins. We are talking about hoarding—the speculators taking silver coins because we would not be making any more of them.

Mr. ASHLEY. If I may say so, I thought you were directing your remarks to the 50-cent piece.



Mr. WALLACE. No; I am talking about all silver, the hoarding of silver, and the relationship of the 50-cent piece to the problem of hoarding silver coins.

Mr. ASHLEY. Of the 12 billion in coins, how many are 50-cent pieces?

Mr. WALLACE. 1.1 billion.

Now, just to finish this point, Mr. Chairman. The grandfather-type hoarding, whereby an uncle, father, grandfather or other relative might say "Son, we are not going to have any more silver coins, so I wanted to save one for you." The fact that we would be continuing silver in our coinage we believe would lessen that type of hoarding. If you were to go off of silver completely, such as Congressman Reuss has suggested, there would be absolutely no silver in coinage, and we believe this would have a great tendency for people to hold back silver coins, because there is no more silver in coinage. If you continue silver in coinage to this degree, we believe it will lessen that type of hoarding.

The CHAIRMAN. Mr. McGrath?

Mr. McGRATH. I have no questions, Mr. Chairman.

The CHAIRMAN. Mr. Fino?

We have just started questioning the witnesses again this morning. Mr. Fowler testified Friday when you were not here. We have Mr. Fowler back and Mr. Wallace, the Assistant Secretary, and Miss Eva Adams, the Director of the Mint.

Would you like to ask any of them any questions at this point? You will be given an opportunity later.

Mr. FINO. Not at this time, thank you, Mr. Chairman.

The CHAIRMAN. Yes, sir.

May I ask you, Mr. Fowler, about this Joint Commission. I consider that a very important Commission with the Secretary of the Treasury as Chairman, and the Secretary of Commerce, the Director of the Bureau of the Budget, the Director of the Mint, the chairman and ranking minority member of each of the Banking and Currency Committees of the House and Senate, one member to be appointed by the President of the Senate, one appointed by the Speaker of the House, and four public members.

I hope Mrs. Sullivan will take into consideration, in evaluating this, that it is all right to have alternates up to a point. But I don't think alternates should be allowed unless you have a quorum. If you were to adopt a policy like that, I am apprehensive that you would wind up sometimes having 14 alternates and not having any members of the Board.

What do you think about that?

Secretary FOWLER. That certainly is one of the ground rules I think you would have to impose. I think these procedures probably, as I indicated to Mrs. Sullivan, can perhaps be determined by the principals themselves when they meet in Commission assembled. With these bodies it is always a problem, I think, of assuring the continuity, as it were, of the voting members, of those who have the final authority. And while I think the use of alternates is probably going to be a practical necessity, I would think that the suggestion you made, that the meeting should necessarily include a majority of the principals, is a safety factor that would be useful.

The CHAIRMAN. The Commission will be important, as I see it, regarding the needs of the economy for coins, the standards of coinage, technological developments in metallurgy and coin selecting devices, the availability of various metals, renewed minting of the silver dollar, the time and circumstances under which the United States should cease to maintain the price of silver and other considerations.

So the Commission will certainly be an important one.

Mr. Barrett, would you like to ask questions? You are recognized.

Mr. BARRETT. Yes, sir. Mr. Chairman—I would like to ask Mr. Wallace this question: Will this metal, after annealing, be able to be rolled with the same equipment now in the mint in Philadelphia, or will the new mint in Philadelphia acquire new machinery for rolling in order to coin this metal?

Mr. WALLACE. Mr. Barrett, the new mint which is underway in Philadelphia now will have to be constructed so as to accommodate the cladding features of the new material. It will require extra space for that. It will require extra equipment and personnel for that operation.

As far as the rolling is concerned, once the material is clad, a similar type of rolling equipment would be used, although of course in the Philadelphia Mint we would plan to get new rolling equipment.

Mr. BARRETT. Let me ask you just one academic question. What would be wrong with recalling the silver dollars and the half dollars as we recalled the gold or the gold certificates, to get that silver out of circulation and put it under our protection in the event that we need it? What would be the expense?

Mr. WALLACE. Are you talking about recalling all the existing silver coins?

Mr. BARRETT. I am talking about recalling the half dollars and the dollars now coined in the silver content that we have.

Mr. WALLACE. Well, the problem with the half dollars is that this would cause a very tight supply of them, and if the Government were to call them in in addition to other people—

Mr. BARRETT. I am speaking after you get a supply minted of the new metals, and set a deadline for the return of the silver coins like they did on the gold and gold certificates.

Mr. WALLACE. My only hesitancy would be the fear that with this in the offing, people would be holding them in moderate quantities, and yet the total quantity being held off would be substantial, in the case of the half dollar. Of course the dollars are already off. But I think this, again, would be one of the questions that the Joint Commission could consider after the new coinage is in effect.

Secretary FOWLER. If I may add one comment to that—we felt, as Secretary Wallace has indicated, that this is the type of question which is much better considered subsequently by the Joint Commission after the new coinage is in and in volume form. At that time, if you attempted to accelerate the normal process of simply retiring old and worn out coins, the impact of any hoarding that might be stimulated could be much better absorbed without any damage to the coinage system that might cause you to lose a bit of control over the silver, as it were, that is in those coins—but that rather than face into that problem now and make even that tentative decision now in connection with this program, we would prefer that it be deferred—otherwise we might excite hoarding some of the existing coins that otherwise people would not think of at this time.



Mr. BARRETT. I assume that you and Miss Adams, as well as Mr. Wallace, have given a great deal of thought to this situation.

Secretary FOWLER. Secretary Wallace and Miss Adams have been working strenuously on it for years, you might say—since the problem emerged. I, myself, have only been able to come close to it since I assumed office on April 1. It has been a real problem, along with all other things, to take the time that was necessary. I apologize for the fact that there was an interregnum between April 1 and today, but I really had to take a great deal of time, just to familiarize myself with the issues that are involved in this program, and to take the necessary decisions.

I obtained what I thought would be adequate advice from my colleagues and associates, and share the responsibility with them of the decisions that had to be made. And this did take some time.

I recognize, therefore, that the members of this committee will have some time to take in resolving the questions that come to them. I hope that—we tried to make available to you, Congressman, the fruits of our labors and decisionmaking, not only as they appear in the Treasury staff study but in the other reports, and in the President's message, we tried to have a fairly full review of not only the answers, but also the issues and the situation out of which the answers emerged.

But we have, I think, given this particular problem—internally in the Treasury, at least—as careful a study as any problem I am aware of in recent times.

Mr. BARRETT. Thank you very much.

The CHAIRMAN. Mr. FINO?

Mr. FINO. Mr. Secretary, I am very much concerned about what might occur and what might follow if we start going off on these different tangents, minting these new coins. My first reaction would be that all of the other coins are going to start going out of circulation, not coming back to the Treasury but going into the pockets, the safes and the tin boxes of everyone.

Now, we have seen the experience we had with the Kennedy half dollars. We minted about 250 million pieces. We don't see any around in circulation, it is pretty hard to see or get any.

Now, I don't know whether you are familiar—I introduced a piece of legislation, I think it was in January, and this is in line with the shortage, the coin shortage. During this period of emergency, instead of going into this metal business and cutting down the amount of silver in the coin, that during this period of emergency the Treasury Department should authorize the issuance of paper scrip, in denominations of 25, 50-cent pieces. Nobody is going to hoard paper. It will be in wide circulation, and you wouldn't have the problem that I think you are going to be presented and confronted with if you start minting these new coins.

I would like to have your reaction to that.

Secretary FOWLER. Yes, I do not think there will be any more tendency to hoard the new coins than there would be to hoard the new scrip, because the new coins, when they come on the market, as I tried to explain in the statement—and we did discuss it some on Friday—the new coins will be produced in a very, very substantial quantity before any of them are introduced into the market. In other words, you build up a very large inventory of the quarter, the new nonsilver quarter, and do not release them into the market until you

have a very large supply, with a follow-on heavy production, so that the normal incentive to hoard the new coin will be avoided. There is a provision requested here also that we be allowed to use the year of first production for a period of time. Except for a few days or a few weeks, perhaps, or at most a month, when it is a novelty, it will become the most commonplace element in our medium of exchange, and I would not think that there would be any more tendency to hoard that than there would be to the new paper scrip. Indeed, it might work out the other way.

If it were thought that the new paper scrip was going to be just a temporary expedient, and it would be at some point sharply cut off, there might be some tendency to put a few of them away, pieces away, just so that you had it for your collection.

Mr. FINO. Well, Mr. Fowler, it would be to the advantage of the Government if 190 million people hoarded \$100 of this kind of money, and just put it away. Whereas, when they are hoarding coins that have silver content, they are hoarding something of value.

Now, let me ask you this. Is it your intention to just temporarily mint these types of coins that you have now with this alloy in it?

Secretary FOWLER. Oh, no, this is permanent. This is being presented for as far as we can see the coinage base for the dime and the quarter.

Mr. FINO. All right.

Now, we get back to the scrip question.

There is a pressing need to try to save as much silver as possible. There is a great demand for silver. Wouldn't it be more advantageous to the Government to hold onto all of its silver and just issue this paper, until things sort of work out?

I think it would be a tremendous advantage to the Government if we had hoarders among the people of this paper scrip.

Secretary FOWLER. In the continued use of the minting of the present silver coins—which will go on contemporaneously with the production of the new coins in volume—it is true that we will be consuming substantial amounts of the silver stock. We think, however, in view of the present situation with regard to the coinage we still have some need for further heavy production—that any temporary shift at this time to the paper money, which would have a very short life, 18 months perhaps, and would not be compatible with the merchandising devices, the vending machines which I have indicated, would add a new and more or less complicating factor to an already complicated situation. The silver we have was more or less acquired for, and its use contemplated as, coinage. Therefore, we felt it was desirable to go ahead and mint the dime and the quarter, the one that we have today, continue to mint it, until we had in sufficient quantity, the new compatible coin of the nonsilver content, that could go into the stream of commerce. Now, this again is a question of judgment, sir, and it may well be that—it may be that we have made the wrong judgment here.

However, I can only say it has been given very careful consideration, and we have just come down——

Mr. FINO. When you say careful consideration, you mean to the paper scrip?

Secretary FOWLER. That is right. Indeed, and some other alternatives.



Mr. FINO. I mean this is not a novelty. It is not something new. Most of the European countries have that, don't they?

Secretary FOWLER. Certainly some of those countries do.

Mr. FINO. The Scandinavian countries; Sweden, I think.

Secretary FOWLER. Yes, sir; it is used in other countries.

Mr. FINO. I would like to see that, because this would be a novelty—25 cents in paper. And you have millions of American people hoarding that. Wouldn't it be a bonanza for the Treasury Department?

Mr. WALLACE. Mr. Fino, a year ago this question came up before the Fascell subcommittee, which was looking into the coinage situation. At that time they took the testimony of various business groups. They testified in horror at the idea of having to count all this paper, which would be floating around.

Another thing which entered into our studies was the fact that the last time paper currency was used, for fractional currency, was during the Civil War, where it was derisively referred to as shinplasters. There seems to be just general agreement that, all things considered, this would not be a very effective solution.

Mr. FINO. Well, of course, it all depends on the amount of trust that people have in the integrity of our Government. You fellows, through our efforts, took the silver from the silver dollar. No one paid any attention to it. They have confidence in their Government—they know the money is worth every dollar it says it is. The same thing applies to scrip. If you had 50 cents or 25 cents scrip or even 10 cents scrip, as long as Uncle Sam is behind it—I don't know for how long—but at the present time as long as Uncle Sam is behind it, it still had the value that it should have.

Mr. GETTYS. Will the gentleman yield, please?

Mr. Fino, the thought occurs to me—what would happen to the vending industry with paper money?

Mr. FINO. Well, they could pump out all kinds of coins without any silver in it, if that is the problem. It doesn't have to have silver. All it has to have is some amount of electrical properties to make those machines work—just like we have in New York City, turnstile coins—those things have a certain amount of electrical property that makes the machine work. So that is no problem. I am trying to save the Government all of this worry and concern about the silver. I say leave the silver alone, stock it, pile it up, and let's get some paper out and take care of this problem.

Secretary FOWLER. I think, Mr. Chairman—

Mr. FINO. I was just told my time has expired.

Secretary FOWLER. I think for the record I might just include the comments in the sixth report of the Committee on Government Operations.

The CHAIRMAN. If you think it is important, it will be placed in the record.

Secretary FOWLER. It is on page 29, and carries over to the top of page 30 of that report. It is House Report No. 194 of the 89th Congress.

The CHAIRMAN. We will be glad to have it in the record.

(The information referred to follows:)

F. Recommendation was made at the hearings that the Treasury seek legislative authority for standby authority to print scrip. The chief merit of scrip is that

while the processing of coins to meet severe shortages takes considerable time, scrip, in large amounts, can be printed quickly. It could be held in stock at Federal Reserve offices, in readiness for use in the event of a shortage. Some companies have wanted to issue scrip of their own for use during the shortage, but their efforts have been considered usurpations of Government powers. While there was support at the hearings for the issuance of scrip by the Treasury, these objections were raised: The impracticability of counting individual pieces of paper with the rapidity with which coins can be counted; the relative ease of counterfeiting such paper, the inability to substitute scrip for coins in vending machines, parking meters, and other coin devices; and its very short life, which would be costly to the Government. From the Treasury's standpoint, the policy questions which would be involved in determining whether or not to seek legislation which would authorize it to issue scrip apparently had not been considered.

The CHAIRMAN. In order to clarify the record, this fractional currency was put out about a hundred years ago, if my information is correct. And some is circulated even now, is it not, Mr. Secretary?

Secretary FOWLER. I am not familiar with it.

The CHAIRMAN. You seldom see any of it. But collectors have it.

Secretary FOWLER. I would think so.

The CHAIRMAN. I assume under existing law it could not be done.

Mr. FINO. In what denomination?

The CHAIRMAN. Fractional currency: 10 cents, 25 cents, 50 cents. And about Uncle Sam being behind this, Mr. Fino was not here the other day, but I think we made a good case, showing that all this money is legal tender, and being legal tender it is good for the payment of all debts, public or private. And, of course, the debts are rather large now: about \$1.3 trillion. And anything that is good to pay debts, and that people must accept in payment of debts and taxes, public and private, I don't think there is any question about the money not being good. Mrs. Sullivan?

Mrs. SULLIVAN. Mr. Secretary, your predecessor thought 26 million Kennedy half dollars would satisfy the initial demand, so there would be no rush for the coins and no hoarding or speculation. He was just about as wrong as could be. The mint has turned out over 10 times that many, and yet none of them show up, except rarely. The drugstores sell them for \$2, with a 39-cent keyring. You were asked, I believe, whether any steps were contemplated to assure that the new coins would not be diverted. And you said, I believe, there would be so many available from the start that this would be no problem. I just hope that you are not falling into the same trap that Secretary Dillon did on the Kennedy half dollar.

Secretary FOWLER. I certainly want to qualify that "no problem." I hope that we can minimize that problem by quantity production and initial quantity distribution, so that we don't get into this pattern that unfortunately occurred at that time.

Now, I could as easily be wrong as anyone else. But we do think, looking back on that experience, that it would be wise in the future, in issuing a new coin, particularly one that might be susceptible to collecting, to have a very large quantity of it initially issued so that there would always be a possibility that anyone who wanted one would be able to get one in the normal course, shall we say.

Mrs. SULLIVAN. I asked Miss Adams this question once before, and she was rather horrified at this idea, but why couldn't the Treasury defeat this insatiable demand for bright shiny new coins to be hoarded away for future speculative numismatic value by turning out for the



remainder of the shortage period coins which have been dipped in some sort of solution to darken or mottle them, so that they are not possibly of any attraction for future collectors? They could be made to look circulated even if brand new.

Secretary FOWLER. Anything that is different the collectors might find great value in.

Mrs. SULLIVAN. They would be looking for the dirty ones, then?

Secretary FOWLER. That is right.

Mrs. SULLIVAN. I want to ask you about the dates on these coins, Mr. Secretary. You said in your statement Friday that the coins would be dated as of the first year of their issue, and that would mean probably 1966. But the bill gives you authority, I believe, to continue the 1964 date, is that correct—in section 9?

Secretary FOWLER. Yes. That is the significant part of it, I think.

Mr. WALLACE. The bill would provide the Secretary authority to start with the date of coinage or issuance and continue it until he is convinced that there is no problem of coin shortages.

Mrs. SULLIVAN. Wouldn't it be advisable to continue using the 1964 date if the half dollars so strongly resemble present coins, and if the dimes and quarters are also so close to the present ones, except for the edge? In fact, if you followed my advice and roughed up or dirtied the coins a bit, no one casually receiving one of them would have any occasion to even notice the difference. Isn't that so?

Secretary FOWLER. We did talk about continuing the 1964 date at some length. I think it is a point—it is not a black and white question whether it would be more desirable to use 1966, 1965, or 1964, but the particular provisions I think that we would now request is that, notwithstanding the pertinent section, all coins minted from the date of enactment shall be inscribed with the year of the coinage or issuance unless in the judgment of the Secretary of the Treasury such inscription is likely to contribute to a shortage of coins, in which case the particular coins involved may be inscribed with the last preceding year whose date has been inscribed on coins of the same denomination.

Mrs. SULLIVAN. So you could continue, then, the 1964 date, if you felt it was desirable?

Secretary FOWLER. Either 1964, 1965, or 1966, or whatever the date of issuance was. It is optional.

Mrs. SULLIVAN. I have some questions for Miss Adams, but my time is up.

The CHAIRMAN. Mr. Reuss?

Mr. REUSS. Mr. Secretary, I think the presentation on pages 14 and 15 of your testimony, on the protection of existing silver coinage, is impressive. You dispose of one hazard, that there will be hoarding in anticipation of a coin shortage during the production period for the new coins, and you point out, I think, quite properly, that your production capacity would be so impressive that you could beat that one.

You then point out your ability to control the melting down problem by two methods—by maintaining a \$1.29 an ounce offer to sell, and secondly, as a final resort, instituting direct prohibitions over the melting down of silver coins if you need to.

I think as far as it goes that answers it pretty well.

But what about the third possibility, which I don't think is a very real one—that a numismatic craze would cause people to hoard all or part of this 12 billion presently circulating silver coins?

I would like your answer.

My tentative one would be if they do that, great. Instead of the stuff coming into the Treasury in 25 years, it might take 50 or a hundred years, but meanwhile the Treasury is doing just fine, it issues the new coinage as needed, and suffers no loss.

Secretary FOWLER. Well, insofar as there is a risk of hoarding of the existing coins, we believe that the decision recommended to the Congress, to continue the existing coinage alongside of the new coinage for awhile and then to cease the production of the old coins, but still, during this period of transition, to have it generally understood that the old coins would continue to be in circulation until some subsequent decision might be taken by the Government to accelerate their withdrawal, will diminish any tendency for people to grab up, you might say, the existing coinage during the period of transition. If you are going to face the problem of possibly withdrawing the existing coins from circulation in any massive way, or accelerated way, that is something that should be done well after the new system is installed and is operating, and everyone is generally used to it.

Mr. REUSS. From where we sit now, Mr. Secretary, is it not likely that this country could allow the old 12 billion coinage to circulate for its 25 year life, or whatever it is——

Secretary FOWLER. For the full 25 year life, that is right. Twelve billion coins is a lot of coins—even in terms of——

Mr. REUSS. In the light of that, what becomes of the argument that it is necessary to keep issuing a 50-cent piece with some silver in it to take the pressure off the 12 billion pieces circulating? I shouldn't think there really would be much pressure on that.

Secretary FOWLER. I think there is probably more of a pressure on the 50-cent piece than on the other kind, although anyone who wants to save a silver coin—the grandfather type of collector—I hesitate to use the word “hoarder,” because I don't think that is the thought—but the person who wants to put some silver coins away for gifts, for the children or grandchildren, will always know he can get a new 50-cent piece which has silver in it, as it appears here in the exhibit. There will be no need or desire to hoard or save silver coins generally, because silver is continued in the half dollar.

Mr. REUSS. He would also know that he can also get an old 50-cent piece in about the same ratio to old quarters and dimes as the new.

Secretary FOWLER. The two things I think working together would be continued circulation of the existing coinage, 12 billion silver coins, plus the fact that there is a new silver type coin constantly coming into circulation. If the instinct to hoard silver coins can be arrested or retarded in any way, I think it would be through that device—that combination.

Mr. REUSS. You don't think there is class legislation designed to benefit 50 cent numismatists at the expense of dime and quarter numismatists?

Secretary FOWLER. It was not so designed.

The CHAIRMAN. Mr. Stanton?

Mr. STANTON. Thank you, Mr. Chairman. I have one question for Miss Adams.



Miss Adams, I have been contacted for the last several months by representatives of the metallic powder industry. They happened to be in Washington the date the President's message came over. I showed them a copy of the bill. They were very happy on the establishment of the Joint Commission on Coinage. I informed these people I felt this was the organization that they would work with in pursuing their particular objective of pursuing the idea of molding metal powders into coin blanks. I just wondered if you would clarify the view. Am I correct in that—that this Commission would be one of those studying this?

Miss ADAMS. I am sure, sir, that is the purpose for the Joint Commission on the Coinage—is to keep in step with, to be familiar with, to weigh and give consideration to these new developments which have occurred in these fields.

We, too, have talked with representatives of these companies. We have tried throughout to be very certain that every potential material was considered.

Now, they, themselves, have been working toward improving their techniques, and the potential of their own materials. So certainly this should be watched along the way. And I am sure the Commission—I am speaking not for the Chairman of the Commission—but I am confident that would be one of the things which it would be their purpose to investigate.

Mr. STANTON. They left me with the impression they are not ready yet to present this themselves.

Miss ADAMS. I think, that is quite true, sir.

Mr. STANTON. Thank you, Mr. Chairman.

The CHAIRMAN. Yes, sir. Mr. Ashley?

Mr. ASHLEY. Mr. Secretary, don't you think we can say that within the next 25 years we can anticipate the disappearance for all intents and purposes of our present silver coinage?

Secretary FOWLER. Yes—I think depending somewhat on the decision of the Congress as to the future of the 50-cent piece and the subsequent decision, somewhere ahead, on the provision about what ultimately happens to the silver dollar.

Mr. ASHLEY. We can expect the disappearance will be speeded up toward the end of the period, wouldn't you say?

Secretary FOWLER. Yes, I think there will be that time when it is apparent they are about to disappear, then there will be an acceleration of acquisition among those who want to hold them for collection purposes.

Mr. ASHLEY. And, of course, this is true of 50-cent pieces, our present 50-cent pieces.

Secretary FOWLER. That is right.

Mr. ASHLEY. And if this disappearance accelerates, of course the production will be increased to compensate for that, wouldn't this be true?

Secretary FOWLER. Oh, yes, the production of the new coins would, by that time have taken care of the Nation's coin needs. Perhaps it will be feasible long before to reduce the volume of the initial production of the new coins, which will be at a very high rate initially, to really put the coin shortage to rest once and for all.

Mr. ASHLEY. But what we are talking about is the manufacture of 12 billion new coins, really, or the increased amount over and above 12 billion that is going to be necessary for our growing population.

Secretary FOWLER. That is right.

Mr. ASHLEY. It just seems to me that, in connection with what Mr. Wallace said, that we are trying—the thinking with respect to the three reasons that you mentioned, Mr. Wallace—silver content, speculative value, and so forth—that the speculative value really—the speculative aspect of it, over the long haul, can be rather considerably discounted, because we are talking about a disappearing commodity, disappearing entity, namely, silver coins. Why would you be concerned about whether they disappear in the next 5 years or the next 25?

Secretary FOWLER. Well, I think certainly our primary concern, speaking from the standpoint of the Treasury, is that we want to do everything we can to be sure that these existing coins are around during the next year, 2 or 3 years, while the new coinage production buildup is underway.

I think after a 3- or a 5-year period, the decision about what happens to the old existing coinage is more closely related not to the coinage problem but to what the Government wants to do about silver as such—whether it wants to stay in the silver business.

Mr. ASHLEY. Your principal consideration, I take it, Mr. Secretary, is the utilitarian consideration.

Secretary FOWLER. Right. I think this is one of the reasons we should have the Secretary of Commerce on this Joint Commission, because the question of what happens to the silver using industries will be an important consideration in connection with whatever you decide to do about the existing supply of these 12 billion coins that are then in circulation.

Mr. ASHLEY. Now, do we need one or two prestige coins, Mr. Secretary?

Secretary FOWLER. The recommendations of the President can be properly interpreted as saying that we need at least one, and that the decision as to whether or not we need two, namely the silver dollar, as well as the half dollar, is a decision that can better be taken some time later, after this silver supply and demand situation comes into focus. Certainly it is not practical to distribute at this time a small amount of silver dollars—they would not serve a coinage purpose; they would serve another purpose. Therefore, the decision as to whether or not there will be a further minting of silver dollars is one that we wished not to take at this particular time, at least in submitting a recommendation.

Mr. ASHLEY. Well, if you persist, and if the Congress wanted to persist in the proposal for the new 50-cent piece, I don't quite see how we can help but really label both the silver dollar and the 50-cent piece as a prestige coin, at least based on the experience we have had with the Kennedy silver half dollar. Is there any measure of how many Kennedy silver half dollars are actually in circulation, being used?

Secretary FOWLER. I don't think there is any accurate measure.

Mr. ASHLEY. We do know there has been some 240 million——

Secretary FOWLER. 274 million, as of April 30, 1965.

Mr. ASHLEY. 276 million minted—as against an original estimate of somewhat less than 30 million.

What was the original estimate as to how many would be minted?

Secretary FOWLER. I think the 30 million, actually 26 million, were just for initial distribution. I don't think there was any ceiling fixed at the time of the initial adoption.



Mr. ASHLEY. If the new half dollar is the only coin with a significant amount of silver in it, wouldn't you expect the same kind of hoarding to take place, unless they are introduced in such volume, really over and above the utilitarian purpose?

Secretary FOWLER. I think the difference between the silver content is a very significant one.

The new 50-cent piece would have only about 20 cents worth of silver. There is a very considerable difference there, in its attraction for what I would call the speculation or hoarding that has to do with the price of silver.

Mr. ASHLEY. But isn't it possible you may have to have two or three times as many 50-cent pieces of the new variety in order for that 50-cent piece to serve the utilitarian purpose because of the fact it is the only coin with a respectable amount of silver in it?

Secretary FOWLER. I would say that there is some possibility that you would have to have more than you would ordinarily produce in order to make it a circulating medium, and to exhaust——

Mr. ASHLEY. And wouldn't this increase as we get toward the end of the 25-year period where all of the silver coins are disappearing except the 50-cent piece, the new 50-cent piece?

Secretary FOWLER. Well, I think that would depend a lot on what had happened to the price of silver in the meantime.

Mr. ASHLEY. Thank you very much.

The CHAIRMAN. Mr. Gonzalez?

Mr. GONZALEZ. Thank you, Mr. Chairman.

Mr. Secretary, since Mr. Fino was talking about paper currency, I have a good supply of wooden nickels left over from my campaign, and I might like to interest you in a good supply of wooden nickels.

But, seriously speaking, it seems to me that in bringing about a transition to the new coinage, the big problem would be the present problem—and that is safeguarding the Treasury's adequate supply of silver. Would you agree with that?

Secretary FOWLER. Yes, I think this is certainly one of the real overriding considerations in moving from the one system to the other without encountering any coin shortage on the way.

Mr. GONZALEZ. Well, do you believe, then, that the biggest problem in this transition period, assuming we enact this, would be raising adequate safeguards against hoarding?

Secretary FOWLER. Well, I will have to answer that question this way. I think this is a big problem. But I think that the choice of means to avert or to retard or to arrest the tendency to hoard is a fairly subtle business. As I indicated the other day in answering a similar question, sometimes the excessive use of controls and of making a fairly dramatic thing out of this has a counterproductive effect. And we would hope that the assurances that were outlined in the statement about protection of the existing coinage would avert or arrest or retard this tendency certainly during the period that the new coin system is coming into operation.

I don't think it can ever be completely averted over the long 25-year pull, as my colloquy with Congressman Ashley indicated.

There may come a point—when the Government has decided, in effect, to withdraw the old coins from circulation, or when the 25-year period or whatever period of maximum use seems to be approaching an end, somewhere in this period, between 5 years and 25 years—when

there will be this inevitable tendency of people to accumulate for remembrance sake and for collections and whatnot some of the old coins.

Now, what happens to the tendency to collect these old coins because of their silver content will depend a lot upon what happens to the price of silver after this transition period, and that, in turn, will depend a good deal upon decisions that we don't suggest the Congress take now, but that it take sometime later after the new system is inaugurated.

Mr. GONZALEZ. However, though, there are some threats in the immediate future—the possibility of a run on the Treasury through the redemption of silver certificates. Is there any possibility at all there? Anybody holding a certificate today can redeem it, can he not?

Secretary FOWLER. Yes. We have enough silver to take care of that situation, and have a goodly supply left over. So we are not too apprehensive about that.

Mr. GONZALEZ. In other words, you feel that the supply is adequate to continue a rate of redemption and, at the same time, fulfill the coinage requirements?

Secretary FOWLER. Yes, sir.

Mr. GONZALEZ. And since the Government is still in the silver market—I was very happy to hear you say that eventually perhaps it would not be, and I guess this is a solution that we would ultimately be traveling toward. But in the meanwhile, I am correct when I say that any holder of a silver certificate can redeem the silver certificate, regardless of his nationality or the ultimate use of that silver he has so redeemed.

Secretary FOWLER. That is right.

Mr. GONZALEZ. The reason I ask this is that I was across the border recently, and went over to a shop in Mexico, and I saw some silver certificates on sale for \$1.65, American money, with a picture of President Kennedy instead of the usual figure—in other words, it was a Kennedy dollar they were selling for \$1.65. They cut out a picture, and pasted it on the dollar. I don't have it with me, because I left it back home. But I notice that every one of these dollar bills on sale were silver certificates.

Now, what I am getting at is that conceivably a Frenchman could come over and redeem any number of silver certificates, get the silver from the Treasury, help deplete its stock, take it to France, and ultimately this silver bullion would be converted to French francs. And what happens there is a real good source of free foreign aid for France, because if that bullion is ultimately struck into francs, it increases from its \$1.29 per ounce value in the United States to over \$3 its monetary value as a franc.

Now, is there anything we can do to put a stop to this kind of practice?

Don't you feel alongside some of the recommendations the President is asking now that we ought to reinstate the transaction tax, for example, and have some export controls, such as the President is requesting now as a standby request?

Secretary FOWLER. In view of the general world market situation today in silver, we are reluctant to ask for that and to go into export controls on silver bullion or silver in that form, which is, I guess, what you are talking about, because we think it would lead very



quickly to a two-price system with all the attendant black-market and gray-market type of operations that would be very disturbing.

We don't see currently in the world market situation the kind of practices that you have indicated.

Now, they could develop and they could occur. But I really believe in a kind of let's-not-rock-the-boat attitude, and take these things calmly as the right approach now.

Mr. GONZALEZ. In other words, you don't see any real speculative effort at this moment in the international market. I don't know what we can do to control the international market. But there is a lot we could do to control the domestic.

Secretary FOWLER. That is right.

Mr. GONZALEZ. I just wonder if we have any idea of how much of this redeemed Treasury silver is going out of the country, such as to France, for example.

I wonder how much of our American silver is going into their new minting of 20-franc pieces.

Secretary FOWLER. Our export figures on silver indicate that for 1964 we exported 52,893,000 ounces to the United Kingdom, 15,481,000 ounces to France, 10 million to West Germany, and there are figures for all other countries—but the total exports, 109 million ounces.

Mr. GONZALEZ. I notice in this little booklet, which interestingly enough had some various statistics put out by Handy and Harman, and I think it was sent to me some time in January—it made a very emphatic statement. "For the first time since the lend-lease shipments of World War II, the United States was a net exporter of silver."

Secretary FOWLER. That is right. Last year we imported, I understand, about 52 million ounces of silver.

Mr. GONZALEZ. My time has expired, Mr. Secretary.

The CHAIRMAN. If someone presented a \$1 silver certificate or a \$10 silver certificate, you are not obligated to give them coins for that?

Secretary FOWLER. No.

The CHAIRMAN. You can give them bullion, silver in a raw state?

Secretary FOWLER. That is right.

The CHAIRMAN. Is that what they are doing now?

Secretary FOWLER. That is the practice now.

The CHAIRMAN. Mr. Mize?

Mr. MIZE. Thank you, Mr. Chairman.

Mr. Fowler, on Friday you told me that a melted-down present 50-cent piece was worth about 44 to 47 cents, is that correct?

Secretary FOWLER. 46 cents, I believe.

Mr. MIZE. That is close enough.

Secretary FOWLER. The silver content of the proposed new 50-cent coin is worth 19.7 cents.

Mr. MIZE. Well, now, with a guaranteed purchase price of silver at \$1.25 a troy ounce, what will be the melted down value of the present silver dollar?

Secretary FOWLER. The present silver dollar?

Mr. MIZE. Yes. If the price of silver is at \$1.25.

Secretary FOWLER. It is slightly below a dollar.

Mr. MIZE. Between 90 cents and a dollar?

Secretary FOWLER. That is right.

Mr. MIZE. And the 25-cent piece would be——

Secretary FOWLER. I can give you the intrinsic value of the present coins, 9.4 cents for the dime, 23.5 cents for the quarter, and 46.9 cents for the 50-cent piece.

Mr. MIZE. Now, that is with the purchase price of silver at \$1.29, roughly?

Secretary FOWLER. That is right. Those figures are translated in terms of \$1.29 price.

Mr. MIZE. I assume that the Treasury Department has a good educational and public relations program lined up to explain to the American people what this is all about, using the National Advertising Council, like you do on your savings bond sale, and so forth.

Secretary FOWLER. We have a very limited public affairs office, Mr. Mize. We have kept it fairly well down. I think we are going to have to depend for general understanding in this area on the business and trade press, as well as the general press, the banking community and other various organizations that have a professional or institutional interest in this problem. Whether it will become necessary to call on the Advertising Council, which has many, many requests, is still a question. We are certainly conscious of the public relations aspect of this. We have our own staff geared up to provide information as much as possible, considering other demands upon it. But I think the hearings of this committee, the hearings of the Senate Banking and Currency Committee, the debates, the normal public coverage of an item that is of interest and curiosity to most Americans—this is what we are really depending upon.

Mr. MIZE. Of course, the basic difference of opinion appears to be whether or not we should continue having silver in the new 50-cent pieces. The old cliché, “eventually, why not now,” seems to be the feeling of a lot of us.

Secretary FOWLER. I think the real question is whether the Congress wants to go along with the President's recommendation.

Mr. MIZE. Thank you, Mr. Chairman.

The CHAIRMAN. Mr. Hanna?

Mr. HANNA. Thank you, Mr. Chairman.

There is a great concern, as I have learned, from the users of copper in my district. Copper has been advancing rather dramatically in price. I think it has gone up about 50 percent in the last year. The technical study you made says that the use of copper in coins is only a tiny fraction of the total consumption of copper. Can you give us some idea about what the present use of copper in the coins is with the old coins, and what it will be with the new coins?

Secretary FOWLER. I will supply that for the record, sir. I think the figures, when you actually have them, will show it is a very, very minor requirement in the total requirements picture. I should also like to add for your information it is our expectancy and plan to use the copper necessary for this purpose out of the excesses that are present in our Government stockpile.

(The information referred to follows:)



*Copper requirements based on fiscal year 1965 production*

	Fiscal year production (pieces)	Present alloy (pounds cupro required)	New alloy <sup>1</sup> (pounds cupro required)
1 cent.....	3,780,000,000	24,623,000	24,623,000
5 cents.....	1,573,000,000	13,004,000	13,004,000
10 cents.....	1,020,000,000	562,000	4,590,000
25 cents.....	691,000,000	953,000	7,774,000
50 cents.....	192,500,000	531,000	2,929,000
Total.....	7,256,500,000	39,673,000	52,920,000

<sup>1</sup> 10 cents—cupronickel clad on copper, 25 cents—cupronickel clad on copper, 50 cents—silver clad on copper-silver core.

Mr. HANNA. In other words, the United States will not be in the copper market as a competitive buyer at this time?

Secretary FOWLER. That is correct.

Mr. HANNA. I think that is an important point to be made to the public, because I think there might be other indications being circulated, and they may not have a favorable effect on the price of copper.

One other point I noticed. There was an indication in the Treasury's report that you would be using cupronickel cladding on your copper core in a strip form provided by private suppliers.

Secretary FOWLER. Yes.

Mr. HANNA. Now, do you have strong assurance that a sufficient amount of this type of stripping is available from private suppliers?

Secretary FOWLER. Yes; we do. This has not been a casual inquiry. Both members of the Department, the Director of the Mint, her staff, Secretary Wallace, and outside experts that are not interested in the problem have inquired into this matter. I have had advice from all of them, and they all assure me, that the sources of supply are ready, willing, able and reliable, to meet our requirements in this area.

Mr. HANNA. All right.

I would think that—going back to our first point—that if we could also indicate where we would be in terms of copper, even in, let's say on the quarter. If you could provide for the record how much copper actually would be in the quarter, and how much that copper would be worth in a quarter, assuming the highest price for copper. I think the highest price has been a little—about 54.1, if my figures are correct. Assuming the highest—

Secretary FOWLER. The highest price of record; yes.

Mr. HANNA. All right. Thank you, Mr. Chairman.

(The information requested follows:)

*Cost of copper in quarters (based on 1,000 pieces)*

Price per pound	Cost of copper in 1,000 silver quarters, 900 fine	Cost of copper in 1,000 cupronickel- clad quarters
	<i>Cents</i>	
36 cents, current price.....	0.496	\$4.05
54.1 cents, season's high futures price.....	.745	6.08625

The CHAIRMAN. Mr. Grabowski?

Mr. GRABOWSKI. Mr. Fowler, is either the Denver or Philadelphia Mint capable of making the silver strips you are going to have in this new silver-clad 50-cent piece?

Secretary FOWLER. The mints are capable of making the strip, but not the clad material.

Mr. GRABOWSKI. How many companies can make the required silver strips now, and who would they be, do you know?

Secretary FOWLER. There are at least four. There may be more, but there are at least four.

Mr. GRABOWSKI. Would you know who they might be at the present time?

Secretary FOWLER. I think that can be supplied to you.

Mr. GRABOWSKI. Can you supply for the record who might be able to do it in the future?

Secretary FOWLER. Yes.

(The information referred to follows:)

Those that have expressed an interest in the making of silver clad strip for the mint include: Composite Metal Products, E. I. du Pont, Engelhard Industries, Handy & Harman, Olin-Mathieson Co., Texas Instruments, Inc.

Mr. GRABOWSKI. How long do you think it will be before the mints can furnish enough silver strips that they will be needing?

Secretary FOWLER. How long before the mints can furnish——

Mr. GRABOWSKI. The silver strips that they will be needing in the future.

Secretary FOWLER. Well, I think the strip can be furnished now. We cannot do the actual cladding process until we get the new cladding facilities and become once again a completely vertically integrated operation from the basic raw materials.

Mr. GRABOWSKI. You know, Mr. Fowler, I associate my remarks with Mr. Mize, that on all this legislation, a very weak point in my mind is the advisability of having any silver at all in the 50-cent piece. I know you have mentioned for the record that this is something that causes you concern. But what if we just didn't have any silver in it at all? Would this overall program just not be able to be brought about?

Secretary FOWLER. Oh, no. I think I should make it clear that I know of no reason why as a physical or a technical matter the processes by which you arrive at the new dime and the new quarter could not be applied to produce a similar 50-cent piece. The question, however, is not a physical question, but a policy question of whether or not Congress wants to make a complete break from silver or whether it wants to take that decision as to retaining some silver in a coin as a part of our coinage system.

The CHAIRMAN. Mr. Widnall?

Mr. WIDNALL. Thank you, Mr. Chairman.

Mr. Fowler, do you have the information I requested at the last hearing concerning minting of coins in Denver, the silver dollars?

Secretary FOWLER. I don't know whether that is available here this morning or not.

Miss ADAMS. We were waiting for a figure from Denver. They have to estimate the actual. You wanted the number of pieces.

Mr. WIDNALL. Yes.



Miss ADAMS. We have the weights. But an estimate had to be made, because, as you know, these were trial strikes. None of them were delivered.

As a result they were not counted and bagged. And so we have to get from Denver—and it is 2 hours earlier out there otherwise we would have this figure for you. But we will have it later.

Mr. WIDNALL. What is the date on those coins?

Miss ADAMS. 1964. Because under the law——

Mr. WIDNALL. 1964?

Miss ADAMS. Under the law all coins can be dated 1964. The trial strikes of silver dollars are all melted down now, as you know.

Mr. WIDNALL. But the other information is going to be supplied for the record?

Miss ADAMS. Yes; it is just a matter of the change in time, 2 hours earlier, or we would have had the full information for you. I apologize.

(The information referred to may be found on p. 25.)

Mr. WIDNALL. Mr. Fowler, even though it will undoubtedly cost more to manufacture the sandwich coins, there would be a terrific savings in the cost of metals used as \$1.29 silver is replaced by 36-cents-a-pound copper. Would you supply for the record the seigniorage profit for the calendar year 1964 for each of the subsidiary silver coins; namely, the dime, quarter, and the half dollar?

Secretary FOWLER. We are supplying seigniorage data with last Friday's hearing, and I could also supply that right now, if you would take it in terms of estimated seigniorage at fiscal year 1965 production rates.

Mr. WIDNALL. Would you supply that now?

Secretary FOWLER. For the new 10-cent piece, the estimated seigniorage at fiscal year 1965 production rates would amount to \$96 million.

Mr. WIDNALL. Ninety-six?

Secretary FOWLER. Yes.

For the new 25-cent piece, \$162.9 million. And for the new 50-cent piece, \$54.5 million. Total, \$313.4 million.

Mr. WIDNALL. Well, now, in 1964 that would probably run higher, because 1965 production rates are considerably lower, are they not?

Secretary FOWLER. No; they are higher.

Mr. WIDNALL. I am thinking now about putting out the new coins at the same time as the old coins.

Secretary FOWLER. Well, without trying to give you any approximate difference, the figures I have given you now represent a much higher figure than the figures you will get for the 1964.

Mr. WIDNALL. Are you in a position to supply for the record the estimated seigniorage that will take place, profit, through producing the same number of these coins produced in 1964 by using the metallic composition in the new bill?

Secretary FOWLER. Yes; the computation we made was in terms of fiscal 1965. When the matter was raised on Friday, the computation was made over the weekend, based on the fiscal year 1965 production rates—since they are the highest we have of record.

Mr. WIDNALL. Well, do you have that estimate now?

Secretary FOWLER. That estimate is included in the figures I have given you. Oh, you want it for the old coins as well as the new?

Mr. WIDNALL. I want a comparison.

Secretary FOWLER. Oh, yes, let me give you that for the old coins, then.

Using the same fiscal year 1965 production rates—for the 10-cent piece it is \$6.6 million. For the 25-cent piece, it is \$11.2 million. For the 50-cent piece, \$6.2 million.

A total of \$24 million—as compared with the \$313.4 million for the new coins.

Mr. HANNA. Would the gentleman yield for just a minute?

I asked this question the other day.

Does that seigniorage indicate the amount of profit that is made on the coin after the total costs, including the materials and the labor?

Secretary FOWLER. No, that is just the difference in the material costs. The production costs differentials are not figured into that computation.

Mr. HANNA. But I think it is important that the committee realize that those figures do not include the cost of running the mint, which is the labor and the investment and amortization of the equipment.

Secretary FOWLER. That is correct. Nor do they include the additional cost in the cladding process that would be involved.

Mr. HANNA. Thank you.

Secretary FOWLER. I beg your pardon. That does include the cost of the cladding process, which is included as a part of the cost of the material on which these figures are computed.

Mr. WIDNALL. Mr. Fowler, I think you have indicated in your previous testimony that your estimated production rate for 1966 and 1967 will be even higher than for 1965.

Secretary FOWLER. That is correct.

Mr. WIDNALL. So that it can be anticipated that there would be an even greater seigniorage profit.

Secretary FOWLER. That is correct.

Mr. WIDNALL. That is all.

The CHAIRMAN. Mr. Gettys?

Mr. GETTYS. Mr. Chairman—Mr. Secretary, do I understand your position is that the hoarding of silver-content coins will be minimized by the retention of some silver in the 50-cent coins?

Secretary FOWLER. Yes. Secretary Wallace outlined three different types of hoarding, and this will counter one of them, the grandfather type.

Mr. GETTYS. But it is your position that if experience proves that hoarding is very prevalent, that the Joint Commission would have the duty and authority to recommend corrective measures?

Secretary FOWLER. That is correct.

Mr. GETTYS. Could the Joint Commission's recommendations be effective—be made effective expeditiously enough to correct the problems or would we have to go through the whole legislative process again?

Secretary FOWLER. Well, I think—you are speaking now in terms of the new 50-cent piece?

Mr. GETTYS. Yes—or any of the defects that may possibly come to light with experience.

Secretary FOWLER. I would think that the problem of making an adjustment in the program once it is well underway, such as going from the 40-percent-fineness silver half dollar to a half dollar made



out of the same material as the quarter would be minimal. We would have a great deal of flexibility in making changes of that sort once the program was well underway and the production processes were all behind us, and the new type of coin was out and in full circulation. We would be dealing with one aspect of a problem rather than with the total problem. You will have together in this commission, representatives of both the executive and the legislative, and you will have a well ordered way of arriving at any decision that should be taken.

This question of later adjustment of the program is one of the reasons, I think, for not really refusing to fight the bull on these issues; but simply that you can take the decisions better in the light of experience, and execute them more effectively with the benefit of this Commission.

Mr. GETTYS. Thank you, sir.

The CHAIRMAN. Mr. Cabell?

Mr. CABELL. Thank you, Mr. Chairman.

Mr. Secretary, during the course of this hearing, I have heard several questions raised as to what would be the reaction if we didn't get public acceptance of this new coinage. Now, can you conceive of any possible situation of how they could refuse to accept it?

Secretary FOWLER. I really cannot. I think there would be a certain amount of passing comment. But except for some possible isolated funmaking——

Mr. CABELL. Four of these new quarters will buy exactly what a \$1 certificate will. It is legal tender. It operates in vending machines. So what? How could there possibly be any possible dislocation because of a temporary——

Secretary FOWLER. I don't think it becomes a dislocation. I think it would come to, well, comments and criticisms of this or that. But this is the way the world works.

Mr. CABELL. I would like to close with one suggestion, if I may—that if these people heard those new 21-cent half dollars which they say they will, and which I hope they do, and you have a sufficient productive capacity, maybe we could pay off the national debt that way.

Secretary FOWLER. Well, it is a promising outlook.

Mr. CABELL. Thank you.

Mrs. SULLIVAN (presiding). Mr. McGrath?

Mr. McGRATH. Thank you, I have no questions.

Mrs. SULLIVAN. Mr. Hansen?

Mr. HANSEN. Secretary Fowler, is it correct there are approximately 12 billion coins in existence?

Secretary FOWLER. Yes, sir—at least if we assume a 25-year life of the subsidiary coins of the type under consideration before the committee.

Mr. HANSEN. You mean up to and including the 50-cent piece, or the silver dollar as well?

Secretary FOWLER. Yes, sir. The 12 billion figure does not include the silver dollar.

Mr. HANSEN. Of course the number of those doesn't amount to a great deal.

I share the concern of Congressman Gonzalez, which he indicated a bit ago when he made reference to the existing coins in his question.

Now, if it is true that we have 12 billion coins, and there are 170 million people in the United States, less than a hundred coins per person would more than soak those up.

Secretary FOWLER. Right.

Mr. HANSEN. I think we are being a little naive in our approach to this proposition. I have no concern at all—and I am not really an expert on this business of what the numismatist thinks or does—but if you can rev up your production on the new coins, as you say you can, then I would just let them go ahead and hoard them, because you are going to make a big profit on them. And you can continue to feed them to them.

But the thing that I am concerned about, and rather deeply, is the effect that this whole move will have on the existing coinage. The numismatists whom I know say “you can’t lose, all you have to do is go buy it—it has an intrinsic value.” More than that, with the way these people are soaking up the supply, the 25 years that you estimate as its life, you know, on a continuing basis, is going to shrink down to just a few years, in my judgment. I think that this piece of legislation ought to have in it some provision, not for immediate withdrawal of the existing silver coinage, but eventual withdrawal of it, and to handle it in a way that these people could not gain anything by stepping out and buying the existing supply and stashing it away.

I know of instances where people might now have as much as a ton and a half of it in bonded warehouses, on certificates—not too many, but a few.

Secretary FOWLER. We have certainly scratched our brains on some method of preventing this by law. And we have not been able to come up with anything that has sufficient merit—that we felt would commend it to the Congress, or that would not be outweighed by the efforts along this line of the people in the coin business who may try to get 180 million Americans so excited, that they are going to go out and buy coins.

Mr. GETTYS. Mr. Chairman, would the gentleman yield?

Mr. HANSEN. Yes.

Mr. GETTYS. Mr. Hansen—Mr. Secretary, isn’t the real intent of this program that you have suggested to reduce coins as things of intrinsic value, and to make them useful solely as a medium of exchange? Isn’t that the purpose?

Secretary FOWLER. That is the purpose. The sooner we do that, I think, the less opportunity there is to excite the general public, and in effect doing the job that the coin is supposed to do.

Mr. GETTYS. Thank you.

Mr. HANSEN. Mr. Secretary, the thing that concerns me is that I don’t want to leave here, in my later days, with it on my conscience that I was a party to an arrangement that made it possible for a group of smart speculators to make a fistful of money unduly on this proposition. I think there is a danger that this can happen in this matter. In fact, a very real danger.

Secretary FOWLER. I share your view. And I share the same concern. The issue is how is the best way to prevent it. And you would, I think, suggest that it best be prevented by a harsh law that gets everybody all excited and stirred up and gets us back to other periods of law enforcement, that have been fairly few. I am suggesting that we get through this period of the next 5 years, of the adjustment to



this program, by deferring this decision about the ultimate withdrawal of the existing coinage until it can be made away from any impact on this new program.

There are calculated risks, Mr. Hansen, in this business, every way we turn. And I think it is a question for the judgment of the Congress as to what is the course of conduct that is least apt to encourage this tendency to hoard.

Mr. HANSEN. Well, Mr. Secretary, I would like to see you folks that have had this sort of thing on your hands before, who have studied this proposition, make some sort of analysis.

Secretary FOWLER. We have made an analysis, and you have the benefit of it right here.

Mr. HANSEN. Well, thank you very much. But I still am concerned about the problem. I wish there were some way we could figure out to eliminate this possibility, which I think is very real.

Secretary FOWLER. I do, too. This has certainly been a problem that we sweated blood over, and we have not in any sense had a cavalier attitude about the possibility that you mention. Sometimes there are these questions of whether you choose one path or the other, and there are various ways of getting along.

Mr. WALLACE. Mr. Chairman, it should be noted, first of all, that it is to the advantage of coin dealers to stir up the fears of such a shortage in order to get more people to use their services. But it should also be noted that under section 5 of the bill, there is standby authority to prohibit the melting and export of coins, so that if anyone hoards coins for the sake of their intrinsic value in hopes of ultimately melting them down and making a profit, they stand to lose a good deal of money in terms of what they could be earning on their investment in a bank deposit or a savings and loan account or a blue chip stock. This is true because if the hoarding of silver coins were to become a problem, the Secretary of the Treasury would have the authority to prohibit the melting of these coins. Thus it would be rather futile for anyone to hoard the existing coins in the hopes that they could melt them down and make a profit thereby.

I should also like to point out that in terms of general hoarding, 12 billion coins amounts to \$2.3 billion, and that is a great deal of money for people to take off the market and freeze, so to speak.

The CHAIRMAN. We have this situation. We would like to have a 30-minute executive session. We have some requests for questioning.

Mrs. Sullivan, you didn't finish, I know. Mr. Widnall has a question, and Mr. Fino. If we can finish pretty soon, we could have an executive session and not have to come back.

Mrs. SULLIVAN. This is very brief, Mr. Chairman, to Miss Adams.

Miss Adams, I wish you would clear up the confusion, in my mind at least, of how much silver we are using in coinage. The President has said 300 million ounces a year. The Secretary said 203 million ounces in fiscal 1964, and 268 million in fiscal 1965, the present year. You testified before the House Appropriations Committee we were using 215 million ounces this year, and will use 252 million ounces in the coming year.

Are the three of you using different 12 month periods—fiscal and calendar?

Secretary FOWLER. Well, the figure I used to give you that one figure is the one in the table in my statement of 203 million ounces—that was for calendar year 1964.

Mrs. SULLIVAN. For the record, I just felt if you could clear this up, to show exactly how these three different figures were obtained on actual usage and how it can be explained—I know that you keep track of every ounce and every scrap of silver in the mint, and silver dust, so there is no question about the availability of exact figures.

(The information referred to follows:)

#### CLARIFICATION OF FIGURES USED FOR SILVER CONSUMED IN COINAGE

Figure used by the President: 300 million ounces—This is the annual rate of consumption of silver in coinage at our current rate of coin production.

Figures used by Secretary Fowler:

203 million ounces—This is actual silver consumed in coinage during calendar year 1964.

268 million ounces—This is a current estimate of silver to be used during fiscal year 1965. It is based on actual silver consumed in coinage for 11 months, July 1964 through May 1965, plus an estimate for June 1965.

Figures used by Miss Adams before House Appropriations Committee:

215 million ounces—These ounces represent the amount of silver required for the production of the subsidiary coins in our fiscal year 1965 budget estimate. However, this production was not sufficient and had to be increased.

252 million ounces—These ounces represent the amount of silver required for the production of the subsidiary coins in our fiscal year 1966 budget request.

Mrs. SULLIVAN. Miss Adams, I want to express my personal congratulations to you for the fine job that you have done as Director of the Mint in expanding mint production to meet this shortage. I don't know of any business executive in this country, or production executive, who could run all of the plant facilities 24 hours a day, 7 days a week at full capacity, and get away with it as long as you have. I think you are to be congratulated.

Miss ADAMS. Thank you.

Secretary FOWLER. I would also like to thank Mrs. Sullivan for that comment, and to underscore it by saying that if there were E-awards and whatnot, one would certainly be merited here.

The CHAIRMAN. Mr. Widnall?

Mr. WIDNALL. Mr. Secretary, who determines how many coins shall be coined each year?

Secretary FOWLER. I suppose ultimately it is the Secretary of the Treasury on the advice and recommendation of the Director of the Mint. I look to Assistant Secretary Wallace, working with the Director of the Mint, to devise those production schedules and runs. And so far as I know, in terms of my current experience, over the last 2 months, these are not hard-and-fast decisions that are made with any great fanfare. We really delegate that responsibility primarily to the Director under the general supervision of Mr. Wallace.

Mr. WIDNALL. Miss Adams?

Miss ADAMS. Mr. Widnall, may I say that this area is one which has occupied a great deal of our time and attention, because the Mint and the Treasury is just as anxious as you are and as Mr. Fascell's committee was in being sure that the mint makes exactly the amount of coin which is necessary to supply the commerce of the country. We are utilizing every possible device, every avenue of information, and everything that we can in cooperation with the banking industry to find out how many coins will be needed and, upon that, we base the amount of coins we make.



There was a time, as you well know, when our facilities were not quite geared up to do even what we would have liked to have done. Congress was generous in giving us sufficient money to go on the crash program and, with that fine cooperation, we were able to do what we did.

Mr. WIDNALL. Do you presently have the estimated number of coins in each category for 1966 and 1967?

Miss ADAMS. We have a general estimate, sir, but we could not finalize that because, as you know, we are only—we only do what the law permits us to do. Knowing that this legislation would be coming out, we have not actually made out our production program that far ahead, although we have, of course, budgetwise, estimated what we would probably need if—when you change the coinage alloy, we undoubtedly will have to go up for a supplemental appropriation, because we will increase our production.

Mr. WIDNALL. Do you have those figures available?

Miss ADAMS. We can supply those figures to you for 1966—the regular production figures which we estimated prior to the legislation.

(The information requested follows:)

The following is the estimated production contained in our budget request for fiscal year 1966:

*Estimated production*

[In billions of pieces]

1 cent	6.510
5 cents	1.116
10 cents	.930
25 cents	.465
50 cents	.279
Total	9.300

Mr. WIDNALL. Mr. Secretary, one more question: Could any vast increase in the production of coins have a very material economic impact?

Secretary FOWLER. Will the increase——

Mr. WIDNALL. Could an increase have?

Secretary FOWLER. I do not see any material impact. You are speaking in terms of the amounts of labor employed, the amounts of new materials that are used, the amounts of machinery and equipment—I think it would be a minor program in those general terms—nothing compared with the large major production programs of many of our individual companies today or many of the individual programs in the Defense Department.

Mr. WIDNALL. You don't think that the material increase in production of coins would affect the general economy?

Secretary FOWLER. Well, I will put it the other way. The absence of an adequate supply could have a very disruptive effect. But I think assuring an adequate supply would not have any additional effect. It is just preventing an unfortunate thing from happening.

Mr. WIDNALL. That is all, Mr. Chairman.

The CHAIRMAN. We have additional members who have brief questions.

But it would be all right with you, Mr. Fowler, and Miss Adams, for any member desiring to do so to submit a question in writing, and you will answer it?

Secretary FOWLER. Yes.

The CHAIRMAN. Mr. Fino?

Mr. FINO. Mr. Secretary, both the new nickel and the new dime, being of the same metallic composition——

Secretary FOWLER. There is no new nickel, sir. You mean the existing nickel?

Mr. FINO. Yes; that is right. So that the nickel and the new dime, being of the same metallic composition will undoubtedly present us with a situation where the intrinsic value of the 5-cent piece will actually exceed the intrinsic value of the new dime. Does this bother you insofar as public acceptance of the change is concerned?

Secretary FOWLER. No, sir; it does not. I believe as long as the general purchasing power of the dime and the nickel retain their current relative relationships, which they would under the new law, this does not present a problem. Actually, however, it costs more to produce a dime because of the cladding process.

Mr. FINO. Miss Adams, just one question.

How far has the mint gone in preparation for the minting of these new coins?

Miss ADAMS. The mint has incurred no actual experience or anything of that kind, naturally, because under the law we are to make coins of the existing alloy. The mint has, I hope, intelligently sought to estimate what our financial problems would be, how much things would cost, and all of that sort of thing, and those figures we can give you if that is what you mean.

Mr. FINO. Well, assuming that the Congress passes this bill within the next few days, how long will it take you to get these new coins in production?

Miss ADAMS. We can go into production actually as soon as the material is available from private industry, and we have made surveys of this, and found that rather shortly we can get some supply of the new material which, if you approve the recommended legislation, we would be using. However, the mint has not gone beyond finding out what the situation is. In other words, if you are asking if we have made any contractual obligations, we have not.

Mr. FINO. We have gotten the Secretary's opinion on the fractional currency. What is your opinion on fractional currency, in order to relieve this shortage of coins?

Miss ADAMS. Sir, it rather concerns me a bit, from the feeling that the coinage of the country should be one which is efficient, which is economical to produce. If we make fractional currency—as you know, the life of a little piece of paper, at least in my pocketbook would be rather short. I rather think you would have a tremendous manufacturing problem. It doesn't cost much to manufacture this little piece of paper, but you would have to manufacture many more even than coins. Then as you yourself said, to make this material usable in the vast automated machinery, the merchandising setup which has all over this country, and on which so many taxpayers depend, someone will have then, also, in addition to manufacture the piece of metal, because I rather doubt that even the most skilled of the automated vending machines could be transferred to use pieces of paper.

So you would have not only to make the fractional currency, but someone would have to provide for the metallic pieces which would work these vending machines, on which all of you depend, as well as all the other 192 million people in the country.



Mr. FINO. Most of the coin machines require dimes. The bill I introduced in January of this year provides for the issuance of scrip paper in denominations of 25 and 50 cents, to help alleviate this shortage.

Just one question of the Secretary of the Treasury: In view of the present situation, and the great concern of the public, wouldn't it be a good idea if we had on these new coins "In God We Trust"?

Secretary FOWLER. Oh, yes; by all means.

Mr. FINO. Thank you.

The CHAIRMAN. Mr. Gonzalez?

Mr. GONZALEZ. Mr. Secretary, would you favor the revival of the transaction tax and the end use certificate law?

Secretary FOWLER. I, myself, have not studied that to the degree I could give you my own answer. I would prefer to have Secretary Wallace deal with this question.

Mr. WALLACE. Mr. Gonzalez, this question of the end use certificates would mean that you would have to certify, before you could get silver from the stockpile, as to what the use would be. Therefore, you would wind up with a problem of a two-price system; that is, silver which is available for use specifically in industry, and sort of a free floating supply of silver which would be available to speculators and for the world market.

It was this problem of having a two-price system and its pressures in terms of gray markets and so forth which caused us to decide against that.

Moreover, with the program which we have—namely to eliminate the silver in the dime and the quarter, and continue it in only very modest amounts in the half dollar—there should be sufficient silver for all purposes, and there should be no reason for any speculation in silver.

Mr. GONZALEZ. But you have no present way of really knowing the ultimate use of your present sales or redemptions. So I just wonder if it would not be wise to revive these practices that worked effectively during the period they were in force for precisely the same reason that we fear now might happen, that we want to avoid.

I was just wondering if it would not be wise to have concomitant legislation of this type as we go into this new system.

I just wondered what the thinking was among the Treasury officials.

The CHAIRMAN. You may elaborate on that, Mr. Wallace, when you examine your transcript, and give a full answer.

Mr. WALLACE. Thank you, Mr. Chairman.

(The following information was subsequently submitted for inclusion at this point in the record:)

We believe that the basic problem is to maintain the existing silver coins in circulation, particularly during the period needed to manufacture the new coins in adequate quantities, and the basic answer to this problem is maintenance of the \$1.29 plus per ounce for silver with indications that the Government is prepared to do this indefinitely. Limitations on the use of silver such as the licensing of the sale thereof to industrial users, and inauguration of an end-use certificate system, may tend to create a two-price system for silver, with all of its attendant difficulties, as indicated above. Moreover, institution of these and other controls which have been suggested would, we believe, tend to create a psychological reaction which would be counterproductive. In other words, excess indications of a worry about scarcity could tend to create the scarcity. The fact is that we are convinced that silver supplies are adequate for the program.

The standby authority in the bill to prohibit the melting and exporting of coins will also deter the hoarding of them because the potential hoarders will not be able to count on their ability to realize on their investments in coins if there is a possibility that they cannot be melted or exported. If we were planning to take the existing coins out of circulation right away, then it might make sense to have an antihoarding provision as a complementary measure as was the case in 1933 when gold coins were recalled from circulation. However, our present purpose is just the opposite; namely, to keep as many of the existing coins in circulation as possible.

A prohibition on the export of silver bullion may also tend to create a two-price system and additional difficulties. However, it should be pointed out that there is already authority on the statute books in the Export Control Act for the institution of controls over the export of silver bullion if such controls should prove to be necessary.

The CHAIRMAN. Now, our schedule is prepared. We expect to have this executive session.

Tomorrow morning we will meet at 9:15. We will hear all outside witnesses tomorrow morning.

We expect to have an executive session for the purpose of voting on the bill some time after 11 o'clock tomorrow.

With that understanding, we will have an executive session now. We will ask those who are not eligible to be in the room to give us the use of the room as soon as you can conveniently, so we can have this executive session.

(Whereupon, at 11:40 a.m., the committee adjourned, to reconvene at 9:15 a.m., Tuesday, June 8, 1965.)



# COINAGE ACT OF 1965

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TUESDAY, JUNE 8, 1965

HOUSE OF REPRESENTATIVES,  
COMMITTEE ON BANKING AND CURRENCY,  
*Washington, D.C.*

The committee met, pursuant to recess, at 9:15 a.m., in room 2128, Rayburn House Office Building, Hon. Wright Patman (chairman) presiding.

Present: Representatives Patman, Multer, Barrett, Mrs. Sullivan, Reuss, Moorhead, Stephens, St Germain, Gonzalez, Minish, Weltner, Hanna, Grabowski, White, Gettys, Todd, Cabell, McGrath, Hansen, Annunzio, Widnall, Fino, Halpern, Brock, Johnson, Stanton, and Mize.

The CHAIRMAN. The committee will please come to order.

I will present for the record a letter from Prof. Lester V. Chandler, professor of economics, at this point.

(The letter referred to follows:)

PRINCETON UNIVERSITY,  
DEPARTMENT OF ECONOMICS,  
*Princeton, N.J., June 4, 1965.*

Hon. WRIGHT PATMAN,  
*Chairman, Banking and Currency Committee,  
U.S. House of Representatives, Washington, D.C.*

DEAR MR. PATMAN: Please permit me to comment on President Johnson's proposal for replacement of our present fractional silver coins. Such a replacement is essential if we are to escape the inconvenience of a serious shortage of coins in these denominations. The President's proposal concerning quarters and dimes is practical and economical and I urge its adoption. He quite properly states:

"For many decades now the value of a particular coin has depended not on the value of the metal in it, but on the face of the coin. Today's coinage must be primarily utilitarian. The new coinage will meet this requirement fully, while dispensing with the idea that it contain precious metal."

Accepting this principle, which is completely valid, there is no justification for retaining any silver in the half dollar. Half dollars made of the same metals as the proposed new dimes and quarters would be utilitarian, economical, and completely acceptable. To retain silver in this coin would add nothing to its usefulness as money and would be expensive for both the country and the Federal Government. I am informed that there are now in circulation approximately 1,564 million half dollars. Since the gross weight of each half dollar is 0.4019 ounce, the total weight of the half dollars now in circulation is approximately 628,571,600 ounces. To replace these with coins having a 40-percent silver content would thus require 251,428,640 ounces of pure silver, which at \$1.2929 an ounce would be worth \$325,072,088. Thus merely to replace the existing half dollars, leaving aside the amounts of silver that would be required for future coinage, would lock up 251,428,640 ounces of the precious metal that would be highly useful for other purposes. And it would add nothing to the efficiency of our monetary system. Moreover, it would be highly and unnecessarily expensive to the Treasury. As already noted, it would require silver with a value of \$325,072,088. If this silver were not included in coins the Treasury could sell it. It would be far cheaper for the Treasury to make half dollars of the same copper and copper-nickel alloy to

be used in the new dimes and quarters. If these metals can be bought at 5 cents an ounce and if we allow for a 30-percent wastage in coinage, so that 898,857,388 ounces would be required, the total material cost of replacing the present half dollars would be only \$45 million. Thus the saving to the Treasury would be more than \$280 million. Even in these days of huge Federal budgets this amount is not insignificant.

Perhaps the proposal to retain silver in the half dollar reflected a desire to protect silver prices and American silver mining. But surely both the prospective demand-supply relationships for silver and the proposal to purchase domestically mined silver at not less than \$1.25 an ounce make this unnecessary.

In summary, I urge prompt enactment of the proposals for dimes and quarters and application of the same principle to half dollars.

Respectfully submitted.

LESTER V. CHANDLER,  
*Professor of Economics, Princeton University.*

The CHAIRMAN. We have two separate groups of witnesses this morning, and we would like to hear from each one individually, and then we will interrogate the witnesses together as agreed upon.

Mr. Hardy, will you come around, sir, and Mr. Strauss, of the American Mining Congress.

Mr. John Stevens, executive vice president of the International Silver Co., and Mr. Wemple, and you other gentlemen from the Silver Users Association will then be heard before the committee questions any of the witnesses.

We will first hear from Mr. Hardy and Mr. Strauss.

Representative Conte is here. Mr. Conte has 5 minutes, and he has a statement to bring out the main points. I think we will hear from you first, sir. You may take your seat there. Then we will hear from you gentlemen next.

You may identify yourself, sir, and proceed.

#### STATEMENT OF HON. SILVIO O. CONTE, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF MASSACHUSETTS

Mr. CONTE. Mr. Chairman, members of the committee, I welcome the opportunity you have afforded me this morning to present my views on the proposals now before this committee for a new coinage system.

I do not believe that the President's proposals are characterized by the breadth of vision or commitment to the total problem which must be the absolute requisites of today's legislation if we are not to find ourselves confronted with another coinage decision in the very near future.

As Members of this Congress, we are confronted with the responsibility of making the most fundamental change in our coinage system since its inception in 1792. That responsibility will only be met by legislation that is as farsighted as that of our distinguished predecessors. I do not believe legislation that includes the retention of silver, in any quantity, in the half dollar will meet this challenge.

I have placed before you a complete statement, together with a proposed amendment, containing my views with respect to the proposed new half dollar. In the interests of time and expediency, I will only briefly summarize it for you.

There are two facets of the coin and silver dilemmas that call for an across-the-board elimination of silver from our subsidiary coins.



First, we are in the midst of a critical silver supply and demand situation. We have reached the point where the annual industrial use of silver, exclusive of coinage, is in excess of the total annual free world production of silver. The continued use of any silver in the subsidiary coins will only aggravate the silver situation.

The position that silver coinage is a luxury this country can no longer afford is not merely a prosilver user nor an antisilver producer argument. The excellent and comprehensive "Treasury Staff Study of Silver and Coinage" indicates that:

There would be an appreciable gap between silver consumption and production even if there were no demand for silver for coinage;

Existing market demand for silver would not be affected since the U.S. coinage requirements have been met from Treasury's stock of silver and not from silver bought each year on the world market; and

The existing silver supply held by the Treasury is likely to be no more than adequate for the short-run stabilization of world silver prices essential to the interests of this country in making the transition to a new coinage system.

Secondly, the purpose of new coinage legislation must be to establish and maintain a coinage system fulfilling its primary function, that of a circulating medium of exchange. I am convinced that so long as we are minting a silver content coin, we will be minting a coin that will not be circulated. This would be especially true if we were minting only one silver content coin.

The present 50-cent piece is the coin that is in shortest supply at this very moment. It has been accorded new stature in these proposals, which, unfortunately, may well spell its demise as one of our circulating coins. It has been tagged with the ignominious title of a "prestige" coin, a coin that will retain a link with the traditions of the past. But, at the same time, I am sure it has been relegated to the fate of the silver dollar.

To those who would argue that we must have a prestige coin, I would reply that it will be a sorry day for this country when its prestige will be equated to a pinch of silver in one of our coins. How prestigious is that coin at any rate, when we have before us a proposal that would cut the measure of that prestige more than in half. We need not a half dollar in the tradition of U.S. silver content coins nor in the tradition of European tokens of a country's prestige. We need a half dollar as a medium of exchange.

Mr. Chairman, the concern of this committee should not be diverted to symbolic prestige coins. The prestige of our present silver content coins is responsible for all of us being here today. We cannot continue to supply the unrealistic demands that are being made for these coins. The only answer to this situation is a viable subsidiary coinage system where every coin, the half dollar, as well as the dime and quarter, is circulated as a utilitarian instrument of commerce.

Let's take the coins out of the pockets of the speculators and put them into the pockets of the spenders.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you, Congressman. We appreciate it. (The prepared statement of Mr. Conte follows:)

STATEMENT OF HON. SILVIO O. CONTE, A REPRESENTATIVE IN CONGRESS FROM  
THE STATE OF MASSACHUSETTS

I have given long and careful consideration to the desirability and inevitability of a change in our coinage system. My interest in the problems facing our coinage system was not initiated last Thursday when the President's message was presented to Congress. I have worked for many years with the Treasury Department, as a member of the Treasury-Post Office Subcommittee of the Appropriations Committee, to maintain a workable coinage system in the face of seemingly unrealistic demands for our present silver content coins. On April 5 of this year, on the floor of the House, I called for a system of subsidiary coins which contained no silver. Today, you, the members of the Banking and Currency Committee, are taking the first step which will lead to the needed changes in the coinage system as we know it today. I urge you to give your thoughtful consideration to a system of subsidiary coins that does not contain silver.

The coin and silver dilemmas are inextricably intertwined. A decision affecting one must, of necessity, bear heavily on the other. A piecemeal approach, resolving today, for example, the coin needs of the Nation and leaving the silver situation for another day can only serve to weaken the proposed solution and compound the problem still existent.

The weakness in the proposals now before this committee is the retention of silver, in reduced quantity, in the half dollar. The President's message and the testimony which has been received from the officials of the Treasury Department, while exhibiting an impressive grasp of an enormously complex situation and a lucid presentation of the position they espouse, are undermined by the failure to propose an across-the-board elimination of silver from the subsidiary coins.

I believe the first question which must be answered, of the many with which the committee is now faced, is: Can we afford 15 million ounces of silver a year to maintain a link with silver through the 50-cent piece?

My answer is that we cannot afford to maintain this link nor is it necessary for us to do so. And, I believe that an arrival at that answer has not been through a piecemeal approach, but only after careful consideration of the coin needs and the silver needs of all.

We are facing a difficult transition period ahead if any change is made in the coinage system. But that transition will only be made more difficult by the proposed new half dollar. We must ask the public acceptance of silverless dimes and quarters having substantially no intrinsic value while retaining silver and intrinsic value, not just in a coin, but in one of the new coins which is part of the proposed legislation.

You know, and I know, that there must be a change in our coinage system and the time for that change is now. We know that the measure of a coin's worth is not tied up in the metal content of that coin, but in the goods and services that can be bought with that coin by its holder. But, we are leaving ourselves wide open for attack with the proposed 50-cent piece. We know, but are we convinced when we continue in the same legislative package a silver-content coin having intrinsic value?

It certainly does not appear that we are convinced and I don't believe that the millions of coin users are going to be confident that we have given them a viable new coin system, effective in all of its aspects to meet the needs of the country as a medium of exchange.

The members of this committee are wrestling with the difficult problems posed by the need for a new coinage system. That need arises from two basic reasons: The decreasing supply of silver at a time when industrial, art, and defense uses of that metal are increasing, and the needs of this country for a coin that will stay in circulation. The proposed half dollar contradicts both of these premises.

We have reached the point where the world uses of silver, exclusive of any that is used in coins, exceed the total annual free world production of that metal. This gap, has, to some extent, been filled by the redemption of silver certificates by the industrial users, tapping the Treasury's stock of silver, now approximately 1 billion ounces, as a supply source. In 1964, for example, 141.4 million ounces of that silver stock were withdrawn to meet the legal requirement to redeem these outstanding certificates. The average monthly certificate redemption for 1965 has been 10 million ounces and at the end of March of this year there were the equivalent of 763.9 million ounces of silver bullion remaining in circulation in the form of these certificates. The Treasury staff study said it is not necessary to immobilize the existing Treasury stock of silver in readiness to meet possible redemption demands, but it is a significant factor, and one required by law, that must be taken into consideration. I would counsel that we should attempt to



keep the Government's accounts in as proper an order as we would our own. The slightest chance that the silver supply might fall below the amount necessary to redeem the outstanding certificates would give impetus to increased redeeming activity.

Pursuing further the silver situation, it will be necessary to continue minting the present silver-content coins until we have built up a sufficient quantity of the new coins that they can be safely placed in circulation, and circulate. During that period, at the earliest it will continue until early or mid-1966, based on the average monthly use of silver for coinage thus far this year, we will be consuming 25.3 million ounces of silver per month. At the most favorable estimate, we will continue this use for about a year and consume more than 300 million ounces of silver from our present stock. In addition, the Office of Emergency Planning has proposed a silver stockpile for national defense needs. The estimated amount of silver for that purpose is 165 million ounces.

I don't see, in the midst of these figures a spare 15 million ounces for a single year's production of half dollars. Nor do I envision a year's production of half dollars that would require only 15 million ounces of silver. The 50-cent piece is the subsidiary coin that is in shortest supply in this country today. In 1964, we minted 206 million 50-cent pieces and did not meet the demand for that coin. At the proposed 40-percent silver content, that would have used up approximately 30 million ounces of silver, almost exactly equivalent to a year's production of that metal in the United States. And, as you know, there must be a backlog of these coins before the first can be put into circulation and that backlog must serve double duty if it is to go into circulation as the coin that is presently in shortest demand. So, it isn't just 15 million ounces of silver a year that we must worry about. It is the amount of silver that will be used to bring the inventory of the half dollar up to the point where it will, in fact, circulate when placed in the hands of the public. That amount of silver must be taken from a stock that is also called upon to meet the demands of certificate redemption, continued transitional minting of the present silver-content coins, and defense stockpile needs. It just isn't there.

And the same could be prophesied for the proposed new silver-content half dollar once it is placed in circulation. It just won't be there. It will be an exception to an otherwise functional coinage system and, while the eminent danger of its being hoarded for speculation in its silver content has been somewhat alleviated by reducing that content, it will be the only coin placed in circulation by the Treasury to contain silver.

I am convinced that it will disappear from circulation as quickly as it is placed into commercial channels. With that disappearance will come increased demands for the coins from banks and commercial users across the country and a spiraling consumption of silver. We have had increasing trouble keeping an entire program of silver-content coins in circulation and those problems will not disappear when the half dollar is retained with any silver content. We have managed to bring the supply of pennies and nickels into a reasonable line with the demands for those coins. I know that everyone here today believes that the new silverless dime and quarter can resolve the supply and demand conflicts for those coins. By minting a 50-cent piece of comparable metal content, we would once again have a coinage system equal to the demands that will be placed upon it.

I do not believe that we should back ourselves into a corner with the half dollar. We should not legislate a coinage program that will be two-thirds successful and find that it would be folly to place in circulation a silver-content half dollar late in 1966 and then have to retrace a portion of the difficult road that we are now traveling.

There are, in addition to the silver use and circulation problems of the proposed new half dollar, production difficulties that the reduced content coin would entail. These problems are not encountered with the present silver-content coins and which will serve only to compound the mint adjustments to the proposed dime and quarter. For instance, the mint has only a limited capacity for melting and rolling silver-copper alloy strips and would have to purchase those strips from an outside source. All of the bonding or cladding operations for this proposed coin would have to be performed in private plants.

The justification for the continuation of some silver in the half dollar can hardly measure up to the potential ramifications of such action. The traditionalist calling for a link with the past, in the words of the Treasury study "must not be allowed to obstruct the transition to a secure coinage system, adequate to the needs of the present."

## PROPOSED CONTE AMENDMENT TO H.R. 8746, THE COINAGE ACT OF 1965

*Title I*

Section 1-a-1 is deleted.

Section 2 becomes section 1 and reads as follows: "A half dollar, or 50-cent piece, a quarter dollar, or 25-cent piece, and a dime or 10-cent piece each of which shall be composed of an alloy of 75 percent of copper and 25 percent of nickel clad on a core of pure copper."

The CHAIRMAN. Now we will hear from these two gentlemen. And next we will hear from Mr. Stevens and his group. Mr. Hardy and Mr. Strauss?

**STATEMENT OF ROBERT M. HARDY, JR., CHAIRMAN OF THE  
SILVER COMMITTEE OF THE AMERICAN MINING CONGRESS**

Mr. HARDY. Thank you very much.

My name is Robert M. Hardy, Jr., and I reside in Santa Barbara, Calif. I am chairman of the Silver Committee of the American Mining Congress.

It is a privilege and a pleasure to appear before you today to discuss the legislation confronting you. I am grateful for the opportunity.

The American Mining Congress has brought to the attention of the executive branch of the Government and both Houses of Congress its views on the constitution of silver coinage. We feel very strongly that a coinage of intrinsic value is the coinage that will demand the respect not only of all people but of all nations and will best serve the purpose as a circulating medium. We have pointed out that the silver content must be reduced; the simple reason being that there is too much silver in the individual coins now being minted. We have considered the arguments advanced for the elimination of silver in the 25-cent piece and the 10-cent piece, and we do not find that they override our viewpoint. We feel that there is enough silver for retention of some in not only the 50-cent piece but in the 25-cent piece and in the 10-cent piece.

The main problem seems to be one of looking ahead to the supply of silver that will be available. I would like to point out that the present price of silver has existed since September of 1963 and that the short time since then has not really been long enough to properly assess the potential of the future. We of the American Mining Congress have been studying this problem for some time and last fall released some of the results of our studies in that we would see by 1968 an increase of 38 million ounces in worldwide silver production, which I must say was a very conservative estimate and in no way optimistic. The figures were derived from projects either already underway or for which the capital had largely been committed, and was a first appraisal of a situation which changes continually and, I must say, on the upward side.

We see underway throughout the world at the present time not only the reopening of old mines, but the exploration for and the development of new properties which will, I am sure, increase that production potential remarkably over the 38 million ounces seen last fall. After all, the production of a metal from the ground is not a procedure in which you plow, seed, fertilize, cultivate and harvest. It is a process in which you must find the deposit and then force the earth



to disgorge it. This is a project which takes time, toil and effort and, I must say, a good deal of money.

I would like to call to your attention the story of uranium which, while not under discussion here today, illustrates so well what happens when one considers a metal that must be found and produced.

Back in 1949 we supposedly had very little uranium in this country, being dependent upon the Great Bear Lake deposit in Canada and mostly upon the Belgian Congo. Russia had just exploded her first atomic bomb and we were desperate.

After due deliberation, a price of \$3.50 per pound for uranium oxide was announced and the search commenced. By 1953, the development of the Colorado Plateau deposits was underway. Soon the extensions of the area into New Mexico and Wyoming were outlined, as were the Blind River, Ontario, and other Canadian projects.

Ten years from the announcement of the guaranteed price, we had more uranium in sight that we could use for the time being, whereas we had been woefully short in 1949.

Again, the point is that it takes time and effort to bring about the development of a mineral deposit so that it goes into production. It does not occur overnight, yet production does answer the call of price. Price in this instance does not mean that the producer is looking for a higher profit. It means that price must cover the cost of exploring for, developing and paying the cost of production so that the mineral may become ore and pass into trade and commerce.

Another example that I might point out to you has already been brought to your attention through the introduction into these hearings of the Treasury Staff Study of Silver and Coinage by the Secretary, Mr. Fowler, and I quote:

Increases in copper and zinc production in the postwar period have far exceeded the expectations generally held in the early 1950's. It is interesting in this connection to compare the actual increases that have occurred with the projections for 1975 made by the Paley Commission in 1952.

The Treasury study goes on to show that by 1962 copper production had already exceeded the Paley Commission's estimate for 1975 by a wide margin, that world copper reserves are very large and that the Paley estimate for 1975 is quite unlikely to be accurate.

I might say the same is true of any Treasury estimate of the production of silver.

Another aspect which has received little attention is that of the newer techniques of exploration which are just beginning to be utilized. You have all heard of the Timmins discovery of Texas gulf sulfur. That was made by the diamond drilling of an anomaly initially outlined by airborne electromagnetic detection methods. There was no surface exposure, but the techniques pinpointed the deposit.

These geophysical techniques are strikingly effective, and we have many areas in this country alone which are susceptible to their employment. For instance, I have information concerning a deposit of over a billion tons located in the California desert, which has been outlined by the newer techniques and is said to contain minable values in molybdenum and gold, with about one-half an ounce silver per ton. If this is brought into production on a large scale, the U.S. production of silver will be enhanced remarkably.

In summation, there is silver to be had, enough to satisfy the needs for coinage and for industry. However, it must be wrested from the earth by toil and effort, and will not spring forth readily in answer to a cry of panic. On the other hand, that cry of panic will not stop it from coming forth in answer to a need.

Thank you very much.

The CHAIRMAN. Thank you, Mr. Hardy.

We will hear from Mr. Strauss.

#### STATEMENT OF SIMON D. STRAUSS, VICE PRESIDENT, AMERICAN SMELTING & REFINING CO.

Mr. STRAUSS. Mr. Chairman, members of the committee, my name is Simon D. Strauss. I am a vice president of the American Smelting & Refining Co., a large miner and refiner of silver. I am also a member of the Silver Committee of the American Mining Congress.

For 173 years the subsidiary coinage of this country, based primarily on silver, has been maintained without substantial change, a record that is unique in economic history. The legislation before this committee would end that era, primarily because of the dwindling reserves of silver held by the Treasury.

Silver miners have been calling attention for years to the problems that would certainly arise because new silver production, lacking sufficient incentives, was lagging behind demand. Until recently these representations were given little heed.

We agree that a change in coinage cannot now be avoided. But in agreeing, we do not mean to imply acceptance of the suggestion made by some that silver has no place whatever in the country's coinage system.

On the contrary, we believe the lesson of history is clear, that currency systems based exclusively on fiat money are in the long run doomed to drastic devaluation.

The ancient Greek city states and the great Roman Empire started out with coinage of intrinsic value. But as they gradually watered their coinage down, so did their economy suffer.

In modern times we have seen the currencies of great industrial nations, Germany, Japan, Italy, and France, depreciate in value almost to the vanishing point as their governments resorted more and more to the printing presses and to token coinage. It is to combat the loss of confidence by their citizenry as a result of this harrowing experience that all four of these countries in the postwar period have resumed the coinage of silver. These governments could realize a larger seigniorage profit today by issuing coins only of base metals.

Why do they spend the money to buy silver instead?

Because they seek the confidence of the man in the street, and they know that silver coinage helps. It touches a deep instinct in the average human, the desire to possess something of intrinsic value or to have it readily available to him.

One cannot deny that a base metal coin bearing the imprimatur of the U.S. Government will be accepted at full face value over the shop counter. It will be legal tender if the Congress says it is, and as your chairman remarked yesterday it can be used in the discharge of all debts.



But, in the long run, if only base metal coins and paper bills are available to the average citizen, will his confidence in his currency, will the purchasing power of the dollar hold up as well as under a system where part of the circulating medium of exchange carries intrinsic value?

The learned economists may give you one answer, but the history of the world gives another.

Today it is true that Great Britain does not have in circulation any currency of intrinsic value, the change having taken place in 1946.

My prepared text incorrectly gives the date of 1964. It was 1946.

Whether the British will succeed in the long run has yet to be determined.

So, gentlemen, while we agree that a change in coinage is now unavoidable, we urge you to retain silver to the maximum extent feasible. The Treasury Department is recommending to you the retention of silver in the 50-cent piece, and is suggesting that the question of the dollar coin be reexamined by the proposed Joint Commission on the Coinage after the termination of the transition period for issuing the new subsidiary coins.

This strikes us as an absolutely minimum program with respect to silver.

Just as we called attention to the deficit in silver supplies when others considered the supplies ample, so now we believe many of the statements with respect to the shortage of silver are exaggerated.

For example, attached to Secretary Fowler's statement before this committee on June 4 was a tabulation that showed a deficit of 205 million ounces in supplies in 1963, and 335 million ounces in 1964—huge figures in relation to the present Treasury stock of 1 billion ounces.

But the Secretary compared total demand for silver, industrial and coinage, with new mine production.

Those of us in the metal industry know only too well that on the supply side, one cannot overlook the flow of metal salvaged from scrap and residues. Good figures on this supply are hard to come by. Handy & Harman estimated that in 1964, 20 million ounces were recovered from demonetized coin of countries other than the United States and that salvaged scrap amounted to about 1,400,000 ounces. But, frankly, our impression as a large refiner of silver is that this latter figure is much too low. Work now being done on recovery of silver from photographic scrap shows great promise for increased yields.

More significant in judging the extent of the true gap between demand and supply are two other factors—the accumulation of inventories by speculators and consumers, estimated by Handy & Harman at 70 million ounces last year, and the inflated demand for silver coinage in the United States.

A major factor in the latter was, of course, the minting of the Kennedy half dollar, most of which disappeared into private hands and did not circulate. It would take a mindreader to ascertain how much of this withholding was due to sentimental desire for a memento of our late President, and how much of it was due to hoarding for the silver content. But our own guess is that sentiment rather than greed was the major factor.

In any case, over one-third of our total 1964 use of silver for coinage was in the Kennedy half dollar.

The heavy demand for the dime and the quarter was out of all proportion to previous years, even allowing for growth in population and the higher rate of business activity.

Thus, in our view, the realistic gap between demand and supply in silver, instead of being 335 million ounces is more probably in the order of 150 to 180 million ounces annually, based on 900 fineness coins.

We agree that part of this gap must be met by cutting down on coinage requirements. The figures in the Treasury staff study indicated that the 900 fineness coin normal demand would be on the order of 100 million ounces a year, and that a 400-fineness-clad coin for the 10-, 25-, and 50-cent pieces would require about 50 to 60 million ounces annually, after the transition period had been ended.

To meet this, the Treasury has available not only the billion ounces of silver in its stocks, but also the silver content of 1,900 million ounces contained in coinage now circulating.

How much of this the Treasury would recover is perhaps debatable. But no one should make the mistake of assuming that this huge stock of silver has forever disappeared from the marketplace. In one form or another, most of it will eventually find its way back, and it will be available either for the minting of new coins, or for the satisfaction of industrial requirements.

Mr. Hardy has dealt in detail with the outlook for supply. Let me say only that the failure of mine production in this country to rise has been due primarily to the lack of economic incentives. While the price of silver is up, it has risen less than the prices of other major nonferrous metals in the postwar period, and much less than operating costs. Nevertheless, because two-thirds of the increase in price has occurred within the last 3 years, more exploration and development work is now underway on silver projects than at any time in the last 30 years. If exploration expenses could be written off currently for tax purposes, this would give a further incentive for more prospecting.

In any case, mine production is now rising.

In the first quarter it was up 17 percent over the corresponding period of 1964 in the United States, and substantial further increases can be expected.

The legislation before you contemplates the fixing of a minimum price of \$1.25 an ounce for domestically mined silver. This floor price was not sought by the mining industry, nor do we attach any great importance to it. Past experience has taught us that, if we accept floors, we may also expect ceilings. So far as we are concerned, we would be just as happy without it.

We share with the Secretary of the Treasury his grave reservations about a system of elaborate controls on exports, hoarding, et cetera. We recognize and sympathize with the motives that prompt legislators to outlaw speculation and accumulation of silver at this crucial time with respect to coinage.

However, silver is a very valuable commodity, and controls that will be observed by honest people are an open invitation to the racketeer and the criminal. A two-price system in silver with higher prices abroad would invite reverse smuggling across the borders. Considering the large number of our citizens who work in Mexico and Canada, and of Mexicans and Canadians who work in the United States, and cross the borders daily, policing regulations would be a



Herculean task. They would involve invasion of personal privacy to a degree that might be intolerable to many.

Gentlemen, we fully recognize the gravity of the situation but we do not believe it justifies swinging to the extreme of completely eliminating silver from coinage. We feel that the Treasury program for continuing silver in the half dollar is a minimum step, and that actually a greater use of silver could be contemplated with reasonable safety.

Thank you, gentlemen, for the privilege of appearing.

The CHAIRMAN. Thank you, sir. We appreciate your statement.

You gentlemen remain available, if you will, please, and we will call you back later for questioning.

We will now hear Mr. Stevens, Mr. Frank Wemple, Mr. Frankovich, Mr. Ramsey, and Mr. Welfling.

Now, you gentlemen have statements to make. You may insert any remarks you desire in addition to the statements that you actually deliver.

We appreciate your cooperation in the interests of time.

Also, Mr. Morris is here.

Mr. Stevens, you may identify yourself, sir, and proceed.

**STATEMENT OF JOHN B. STEVENS, EXECUTIVE VICE PRESIDENT, INTERNATIONAL SILVER CO., AND CHAIRMAN OF THE EXECUTIVE COMMITTEE OF THE SILVER USERS ASSOCIATION; ACCOMPANIED BY FRANK WEMPLE, TREASURER, HANDY & HARMAN; GEORGE R. FRANKOVICH, EXECUTIVE DIRECTOR, MANUFACTURING JEWELERS & SILVERSMITHS ASSOCIATION; DONALD J. RAMSEY, WASHINGTON LEGISLATIVE COUNSEL, SILVER USERS ASSOCIATION; DR. WELDON WELFLING, WESTERN RESERVE UNIVERSITY; ALSO ACCOMPANIED BY JOSEPH T. MORRIS ON BEHALF OF THE NATIONAL ASSOCIATION OF PHOTOGRAPHIC MANUFACTURERS**

Mr. STEVENS. Thank you, Mr. Chairman.

I would like to say at the outset that I will make a brief statement first, and then would like to ask in this order—Admiral Ramsey, Mr. Wemple, Dr. Welfling, Mr. Morris, and Mr. Frankovich to make their statements.

Mr. Chairman, I welcome the opportunity to appear before your committee. I am John B. Stevens, executive vice president of the International Silver Co., Meriden, Conn., and general manager of its silverware division. I am also chairman of the executive committee of the Silver Users Association. My purpose in being here today is to testify before this committee as to the effects the proposed legislation to change the content of our coins will have upon the thousands of men and women who depend upon silver for their livelihoods.

At the outset, may I commend this committee for its prompt and efficient response, and the Secretary of the Treasury for his clear and well spoken testimony before this committee. I am pleased with the President's decision to eliminate the use of silver in dimes and quarters, but greatly concerned over the proposal to mint half dollars of a 40-percent silver content.

The retention of any silver in subsidiary coinage is of vital concern to manufacturers of silverware, both large and small.

This legislation represents one of the first major changes in our coinage system since 1792; it includes a new type of coin, a silver-clad 50-cent piece, which bears the likeness of President Kennedy. This would create a collector's paradise; hence, a downright waste of 15 million ounces of silver, or close to 80 percent of 1 year's requirement for silverware. Think of this in terms of productive returns to our economy, in terms of employment, or lack of it.

As you know, the silverware industry is one of the oldest industries in the United States, first established by the early settlers of New England. To quote one of my associates, "its history is the history of American industry in the best of traditions." How true this is. We believe in tradition, but not at the expense of jobs which would be jeopardized by the continuation of silver in coins.

Our industry grew with our country. Our industry improved with the development of new manufacturing techniques, and our industry prospered through the hard labors of our self-priming economy. The question of supplies of silver is of vital concern to the silverware industry for, without it, we have no business whatsoever. The question of price is also of great concern to us, because the proportion of raw material to total manufacturing cost is extremely high. We take great pride in our craftsmanship, and we strive to provide the public with fine silver products at the lowest possible price. This may no longer be possible. It is believed that the prestige and traditions of the silverware industry far outweigh the rather intangible prestige that one silver-clad half dollar is supposed to impart to our coinage system. Our silver dollar is still our only prestige coin and, as one of the members of this committee pointed out last Friday, this is the reason why it has disappeared from circulation.

The silverware industry, which I represent, is besieged with many of the same problems which other industries face, but by far the most important consideration is the availability of silver itself. In sterling silver flatware, for example, about 75 percent of our manufacturing cost is the cost of silver itself. We use a very high percentage of silver in terms of our actual product. You are all familiar enough with silver to know that the price of silver has increased tremendously over the last 10 years. For example, in 1952, the price of silver was 85 cents an ounce. Today, silver is at the current level of \$1.293 per ounce. This represents a 52-percent increase, gentlemen. This is a very large cost to absorb. Our market has been narrowed because we must pass on this cost to our consumers in order to stay in business. We have many would-be consumers who feel they cannot afford to buy silverware. The silverware industry feels that the upward spiral action on the price of silver was created by Government option, taking such a large stock off the market at above market prices. This may have been necessary at the time to protect the mining industry, but it is certainly no longer necessary for the Government to resume buying of silver. The cost we have had to pass on to our consumers and would-be consumers is beyond our control. Mr. Simon Strauss, vice president of American Smelting & Refining, has raised a question of priorities. He asks in the February 1965 issue of Mining Engineering:



Is it more important to have silver for spoons and forks than to have silver for coins? Millions of people every day are eating meals with stainless steel flatware; others, understandably, prefer silverware. But is it more important to satisfy this preference than to have silver for coins?

Certainly people can eat with stainless steel. They can even eat with their fingers if they prefer. I ask Mr. Strauss why it is important to have silver for coins. If the proposed half dollar is to be looked on as a "prestige" coin, then our national prestige has dropped as a ratio from 90 to 40.

I repeat, we are very pleased with the Treasury's recommendation to eliminate silver from dimes and quarters. Given the facts, this is the only logical conclusion one could arrive at. Mr. Chairman, I submit that the national interest would be better served if the legislation now under consideration were to be amended in such a way to permit the minting of half dollars of the same alloy as dimes and quarters. I believe your decision should be utilitarian, rather than political.

In summary, the silverware industry endorses the action taken by the administration in recommending the minting of dimes and quarters without silver.

Admiral Ramsey, legislative counsel for the association, will discuss the proposed legislation in more detail and other members representing different segments of our industry will also testify briefly.

I would like to say there are other factors in the silver using industry which are important, some of them larger users of silver than the silverware industry. I believe that many people are under the impression that the most important user is the silver and jewelry industry. But in actual fact, the photographic and electrical industries are greater users of silver.

Thank you very much.

The CHAIRMAN. Mr. Stevens, would it be satisfactory for these other five gentlemen to file their statements, and one speak for all of you, or would you like each one to say a few words and present his statement?

Mr. STEVENS. Mr. Chairman, we would like each one to say a few words.

The CHAIRMAN. Well, suppose you present them, then, in the order which you want them presented, and take care of the time on it.

Mr. STEVENS. Fine, sir.

Admiral Ramsey will be the first.

#### STATEMENT OF REAR ADM. DONALD J. RAMSEY, U.S. NAVY, RETIRED, LEGISLATIVE COUNSEL FOR THE SILVER USERS ASSOCIATION

Admiral RAMSEY. I am Rear Adm. Donald J. Ramsey, U.S. Navy, retired, legislative counsel for the Silver Users Association, whose members use approximately 75 percent of the amount of silver consumed in the United States. A list of the members is attached to my statement.

I should also like to compliment the Treasury and the President for their efforts to find a solution to a very complicated problem.

I also would like to compliment the chairman of this committee for his prompt action in handling this legislation as well as the legislation

which became Public Law 88-36 on June 4, 1963. At that time there were dire predictions as to what would happen to the country if we demonetized silver and issued \$1 Federal Reserve notes. The chairman persisted in his efforts and the Nation seems to have survived. I think it will survive without silver in coins.

There has been considerable talk about there being something for everyone in this bill. It has been said that the vending machine industry came out first, followed by the producers, then the users. If silver is completely removed from our coinage, and if it becomes available for industrial users where it is essential, I would say the public has come out on top.

At the hearings held yesterday, Mr. Chairman, a telegram was put in the record which indicated the endorsement of the Silver Users Association of this bill. There must be some mistake, and it is requested the record be corrected. The position of the association is as follows:

The Silver Users Association supports the proposals contained in H.R. 8746 to mint quarter dollars and dimes composed of an alloy of 75 percent copper and 25 percent nickel clad on a core of pure copper. The composition of these coins was determined by the requirements of coin-operated machines.

The association strongly opposes the proposal to mint half dollars containing 40 percent silver. It urges the minting of half dollars of materials which contain no silver.

Opposition to the use of any silver in subsidiary coins is based on the silver supply situation. It is estimated that the deficit between free world production and industrial demand in 1965 will be 75 million ounces. The deficit between U.S. production and demand will be about 90 million ounces. These deficits will increase because industrial requirements will be increasing faster than new production increases. This deficit is now made up by the U.S. Treasury through the redemption of silver certificates for bullion. The use of any silver in subsidiary coins reduces the amount of silver available to make up this deficit.

The President and Secretary Fowler have pointed out that there is no dependable or likely prospect of new, economically workable sources of silver that would appreciably narrow the gap between supply and demand. The Secretary stated this to be the opinion of experts both inside and outside the Treasury. Both stated that optimistic projections envision an increase of no more than 20 percent over the next 4 years and the President aptly pointed out that this would be of little help.

Secretary Fowler has stated that after the proposed new coins are in full production, no more than 15 million ounces of silver should be required for the minting of half dollars. While even this amount of needless consumption is undesirable, we believe it to be a low estimate. Two hundred and six million Kennedy half dollars were minted in 1964 and with the proposed silver content of 40 percent this would require 33 million ounces of silver. After 16 months of production the Kennedy half dollars are still in short supply. No one can predict the normal coinage demand.

Secretary Fowler said that what he calls "the industrial and arts problem" will not be solved by whether we do or we do not utilize silver in our half dollars; however, the minting of these coins at the



1964 rate would use up enough silver in 4 years to supply U.S. industry for 1 year or make up the free world deficit for 2 years. Such facts cannot and should not be overlooked.

The stated reasons for maintaining silver in the half dollar are for prestige and to continue the tradition of silver in coinage in spite of the fact that the President's statement and Treasury report dispute the need for any value in our coins other than that they serve as a circulating medium of exchange. These considerations, plus the fact that the proposed coin is unique in its composition, can only mean that instead of representing prestige it will become a collector's item at least as much in demand as the silver dollar and Kennedy half dollar, neither of which is seen in circulation.

Why does this country need a prestige coin? Only now, after 173 years, when the proponents are hard pressed to justify a 40-percent silver clad coin are we told we must have such a coin. No nation on earth presumes to mint a "prestige" coin with only 40 percent silver.

France, often cited as a major nation using silver in coins, mints two silver coins. But both have paper equivalents. The 5-franc coin containing 83.5 percent silver has disappeared from circulation. The 10-franc coin containing 90 percent silver is designed for hoarding in order to combat inflation. Italy mints a 500-lire coin containing 83.5 percent silver with a paper equivalent which is being withdrawn. Both countries have had volatile monetary and financial histories. Perhaps they need a high content silver "prestige" coin.

The United Kingdom shifted all silver coins to cupronickel in 1947. In 1964, while the United States was consuming 203 million ounces of silver, the rest of the world, excluding commemorative coins, used only 40 million ounces in coins, with Canada using an estimated 14 million.

The silver policy of the United States as set forth in the President's Economic Report to the Congress in January 1963 is "to reflect the status of silver as a metal for which there is an expanding industrial demand." Public Law 88-63 was enacted to carry out this policy. This law spelled out the obligation of the Treasury to redeem silver certificates on demand with either silver dollars or silver bullion at the rate of \$1.29 per ounce. This law also authorized the Treasury to use excess silver for coinage and to sell excess silver to other departments and agencies of the Government. While redeeming silver certificates the Treasury has also been retiring certificates to obtain silver for coinage. It is this coinage drain on the Treasury stocks far in excess of any anticipated amounts which has created the critical coinage situation. It was estimated that 80 million ounces for coinage would be required annually. In the 2 years since the passage of the act, 366.9 million ounces have been required. This is an average of 180 million ounces, and the rate is now 27 million ounces per month. On the other hand, redemption of silver certificates during the 2-year period amounted to only 207 million ounces.

It should be borne in mind that the Treasury, although authorized to sell silver, does not sell silver outside the Government, nor does it fix the market price for silver. However, the fact that the Government carries out its legal obligation to redeem silver certificates at the rate of \$1.29 per ounce obviously keeps the market price from rising above that level.

The Treasury stocks of silver bullion now amount to 1 billion ounces. It has been indicated that 300 million ounces of silver will be

required for the necessary continued minting of present silver coins. A stockpile requirement of 165 million ounces has been announced by the Office of Emergency Planning. Redemption of silver certificates at the present rate may require 125 million ounces this year. Thus, Treasury stocks may be reduced to around 400 million ounces during the next year. This amount would be available to those who desire to have silver certificates redeemed with silver as guaranteed by the Government when the certificates were issued.

The Treasury stock of silver was excess silver removed from the market over a period of 30 years in order to raise the price. Ability to obtain this silver now makes up the deficit between production and consumption in the market. This in turn protects our silver coins in circulation by stabilizing the market price at the guaranteed redemption rate of \$1.29 per ounce.

Any coinage requirement for silver, however small, would be of serious consequence. In addition to reducing the supply it would maintain a speculative interest in silver which would result in increased redemption for speculative purposes. When the Treasury stocks are exhausted, the Government would be forced into the market to buy silver where there is an ever-increasing deficit in supplies.

As previously pointed out, the Treasury could control the minting of the proposed 50-cent piece, but this would in fact only serve to make it more desirable. It would disappear down the way of the silver dollar. If a 50-cent piece is required as a medium of exchange in our monetary system, it should be minted in sufficient quantities to insure its circulation.

The CHAIRMAN. Admiral, will you cease just a moment, please.

Now, of course, obviously we do not have time for each witness to read all of his statement. If each witness will present just a part of it, the members will ask questions of the panel, which will enable the witnesses to bring out many of the points that they desire to bring out. That way it will save a lot of time.

Mr. STEVENS. All right, Mr. Chairman. I would like Admiral Ramsey to comment on this.

Admiral RAMSEY. Mr. Chairman, we have some specific objections or suggestions to this bill which only I will bring up.

The CHAIRMAN. Very well. We would like to have the members given a privilege of asking some questions after you gentlemen take the time you have indicated.

Mr. STANTON. Mr. Chairman, of course you know there are a lot of new members on this committee, and this is an extremely important subject. Even if it is going to take a couple more days, I think it is well worthwhile for the members of the Banking and Currency Committee to listen to the testimony in full from these gentlemen and anybody else who has something to say on the subject.

The CHAIRMAN. It is my understanding that these gentlemen favor the bill generally. Is that correct?

Admiral RAMSEY. We oppose the minting of silver half dollars. And we do have—

The CHAIRMAN. I wish you would confine your argument to what you are opposed to.

Admiral RAMSEY. I have two pages, Mr. Chairman, which will spell out our feelings and objections to this bill.

The CHAIRMAN. Go right ahead, Admiral. Your statement is very interesting.



Admiral RAMSEY. Thank you, sir.

We urge this committee to amend this bill to provide for a 50-cent piece made of the same material as the quarters and dimes or alternatively of some other suitable material not containing silver. The Treasury staff study of silver and coinage concluded that cupronickel is the best permanent material for new subsidiary coinage, ignoring the vending machine problem.

Section 4 permits the continued minting of coins now authorized by law. Secretary Fowler in his prepared statement said this section provides for the continued minting of the existing coins as needed until production of new coinage is adequate. It is recommended that a sentence be added to this section which spells out the Secretary's intention. Suggested wording is as follows:

However, the minting of the half dollars, quarters, and dimes shall be confined to the coins provided for in this act when the production of such coins is considered by the Secretary of the Treasury to be adequate.

There is no limitation in the bill now as to how long the Secretary may continue to mint silver coins.

We feel that there should be some limitation on this authority.

Section 5 authorizes the Secretary of the Treasury to prohibit the exporting, melting, or treating of the coins of the United States. The views of the association concerning controls were expressed in a letter to the Secretary of the Treasury dated May 10, 1965, a copy of which is attached to this statement as exhibit 2.

The proposed penalty for violating any rule or regulation or license issued for melting down coins is \$10,000 or imprisonment for not more than 5 years or both. While this may be intended for large-scale violators, it makes criminals out of individuals who, for instance, may even today melt down silver coins to obtain a few ounces of coined silver for the purpose of making silver trinkets. Articles of coined silver have been very popular throughout the ages. Persons who obtain silver coins pay for them. It is not their fault that the intrinsic value of our coins is high enough to make them worth melting down. It is urgently requested that if the Treasury is forced to resort to prohibition against melting down, such prohibition be in effect only long enough to serve its purpose and that the right of citizens to do what they wish with coins is restored. The Silver Users Association is not opposed to standby controls so long as, if invoked, they are abandoned when no longer necessary.

Section 6 gives the Secretary of the Treasury authority to sell excess silver at "not less than the monetary value thereof." Section 7 not only authorizes but directs the Treasury to purchase domestic silver at a fixed price when tendered. The Secretary of the Treasury has stated that section 7 was designed to provide a floor, inasmuch as section 6 provided a ceiling. It is felt that this ceiling should be spelled out and that the Secretary of the Treasury should also be directed to sell silver at the fixed price of \$1.2929 per ounce.

The Silver Users Association is concerned over the wording in title II, section 3, which provides that the Joint Commission on Coinage shall review and give advice and recommendations with respect to, among other things, the time when and circumstances under which the United States should cease to maintain the price of silver. Although, because of coinage considerations, the United States must stand ready to sell in order to maintain the price of

silver, it is the redemption of silver certificates as required by law which stabilizes the market price at \$1.293. This redemption is the fulfillment of a pledge to redeem certificates with bullion on demand. It is not clear whether this reference to "maintain the price" refers to the \$1.25 buying price established by title I, section 7, or to the redemption value of silver bullion for silver certificates of \$1.29. It should be clear that the Treasury does not currently have any obligation to fix a market price for silver, but it does have a commitment to redeem silver certificates with 0.7734 ounce of silver per dollar. Only when free market prices rise to this point does redemption take place.

It is hoped that the committee will take action to remove these uncertainties. Thank you.

The CHAIRMAN. Now, you have in connection with your statement a list of the members of your association and also a letter to Secretary Fowler, which, of course, will be inserted in the record at this point in connection with your statement.

Admiral RAMSEY. Yes, sir.

(The material referred to follows:)

#### EXHIBIT 1

##### MEMBERS OF THE SILVER USERS ASSOCIATION

The members of the Silver Users Association use approximately 75 percent of the amount of silver consumed in the United States. The total consumed in 1964 is estimated to be at 123 million ounces.

##### Photographic materials:

Eastman Kodak, Rochester, N.Y.  
 Kilborn Photo Paper Co., Inc., Cedar Rapids, Iowa.  
 Xerox Corp., Rochester, N.Y.  
 General Aniline & Film Corp., New York, N.Y.  
 Powers Chemco, Inc., Glen Cove, N.Y.

##### Silverware:

Gorham Corp., Providence, R.I.  
 International Silver Co., Meriden, Conn.  
 Samuel Kirk & Son, Baltimore, Md.  
 Lunt Silversmiths, Greenfield, Mass.  
 Oneida Limited, Oneida, N.Y.  
 Reed & Barton, Taunton, Mass.  
 Stieff Co., Baltimore, Md.  
 Tiffany & Co., New York, N.Y.  
 Towle Manufacturing Co., Newburyport, Mass.  
 Wallace Silversmiths, Wallingford, Conn. (subsidiary of Hamilton Watch Co., Lancaster, Pa.)

##### Dental supplies:

L. D. Caurk Co., Philadelphia, Pa.

##### Chemicals:

Ames Chemical Works, Inc., Glens Falls, N.Y.  
 Catalyst Development Corp., Little Ferry, N.J.

##### Fabricated and industrial products:

Dixie Bronze Co., Birmingham, Ala.  
 Engelhard Industries, Newark, N.J.  
 Handy & Harman, New York, N.Y.

The Silver Users Association also represents the following associations:

Manufacturing Jewelers & Silversmiths of America, Inc.  
 National Association of Mirror Manufacturers.  
 Retail Jewelers of America, Inc.



## EXHIBIT 2

MAY 10, 1965.

Hon. HENRY H. FOWLER,  
*Secretary of the Treasury,*  
*Washington, D.C.*

DEAR MR. SECRETARY: At various meetings with Treasury officials, the Silver Users Association has been asked for its views on the subject of controls and other actions which might be taken in connection with silver bullion and coins, with particular reference to proposed changes in coins. At a meeting on May 4, with Assistant Secretary Wallace and Acting General Counsel Smith, the former suggested that a letter be written to you expressing the views of the association.

The question of controls arises from the possibility that present high-content coins may disappear from circulation to the extent that trade would be disrupted. This situation will occur if these coins are more valuable for their metal content than they are for their face value as a purchasing medium, or if the public believes this will be the case.

The basic position of the association is that controls will not be necessary if—

(1) The public is assured that the Treasury will continue indefinitely the redemption of silver certificates at the present rate as required by law, and if

(2) The use of silver is eliminated in subsidiary coinage.

The Treasury must continue the redemption of silver certificates at the present rate at least until sufficient new coins are in circulation to meet our coinage requirements. This redemption, or Treasury sales at this rate, should be continued indefinitely in order to stabilize the market. This silver was originally acquired to force the market price up to its present level at \$1.29 per ounce. It should now be used to stabilize the price at this level. As long as bullion is obtainable through the redemption of silver certificates, at the present rate, coins will not be melted down for their bullion content. The retention of silver in any amount in any subsidiary coin will increase the current speculative interest which obviously results in hoarding of coins.

Legislative proposals now before the Congress call for a minimum silver content of 30 percent in all silver coins. They also call for a new redemption rate for silver certificates of \$4 per ounce, which would also be the minimum "monetary value" of a proposed new silver dollar. The retention of silver in any coin at a reduced level will raise the monetary value of the coin, thus adding to the confusion and speculative interest. The monetary value is believed by many to be tied into the market price, and today they are almost identical in the case of the silver dollar.

The retention of any silver in subsidiary coins means that sooner or later the Treasury will be forced into the market to buy silver. Statistics which are available clearly indicate that there is now a 25-percent deficit between production and industrial consumption. This deficit is increasing and is made up with silver obtained through the redemption of silver certificates. Consequently any possibility of the Treasury entering the market for any amount of silver can only accentuate the speculative interest. The market supply situation is such that there is no longer any necessity to provide a market for the producers of silver through Treasury purchases.

Regardless of the material used in new coins, there will be increased interest on the part of the numismatists and collectors. This will apply to new coins as well as old. It is believed, however, that the problem will be minimized and within tolerable limits if the public is assured that the metal content of silver coins will not be worth more than their face value. On the other hand, any indication that the metal content will be worth more than the face value will result in the disappearance of such coins. This would be particularly true if the Treasury is required to embark on a program which is dependent upon the withdrawal of these high-content coins in order to provide silver for low-content silver coins.

The following actions have been suggested during the transition period:

(1) Prohibition of the melting down or hoarding of coins.

(2) Export controls of silver bullion and/or coins.

(3) Requirement of end-use certificates from those who obtain silver from the Treasury.

(4) Reestablishment of the transfer tax.

Prohibition of the melting down of silver coins will be unnecessary as long as the Treasury redeems silver certificates at the present rate, which it must do until sufficient new coins are in circulation. Prohibition of hoarding would be most difficult, if not impossible, to enforce. The establishment of a criteria as to what constitutes hoarding would be a formidable task. Unlike the situation which existed in connection with gold coins, silver subsidiary coins are fractional money

and are necessary as a medium of exchange. The solution to the hoarding problem appears to be the elimination of factors which are conducive to hoarding.

The association is not opposed to actions which may be necessary to insure the circulation of coins as a medium of exchange. However, it is requested that all parties affected be given adequate opportunity to be heard prior to such actions.

It is obvious from the foregoing that the underlying problem and its solution is in the intrinsic value of coins. It appears clear that any factor which could make present or new coins more valuable for their metal content than their face value must be eliminated or avoided.

In summarizing the position of the Silver Users Association with reference to controls, it is suggested that the following steps be taken:

- (1) Eliminate the use of silver in subsidiary coinage.
- (2) Assure the public that the Treasury will continue indefinitely the redemption of silver certificates at the present rate.
- (3) Inform the public that the metal value of outstanding silver coins will not exceed the face value.
- (4) Minimize the discussion and use of controls.
- (5) Make every effort to continue the unrestricted use of present silver coins.

Respectfully,

DONALD J. RAMSEY, *Legislative Counsel*.

THE CHAIRMAN. All these statements are good. I have looked at most of them. Yours in particular, Admiral Ramsey, is very fine. In fact, all of them give valuable information.

The committee members will ask questions to bring out additional information, too. All right, you may call your next witness.

Mr. STEVENS. Thank you, Mr. Chairman.

Realizing the press of time, I wonder if this would be satisfactory. I would like to ask Dr. Welfling to make his statement, and then ask that the formal statements of our other witnesses be filed, but that they be permitted to briefly summarize their statements.

THE CHAIRMAN. That will be all right, if it is all right with you gentlemen.

You may go ahead, sir.

**STATEMENT OF DR. WELDON WELFLING, CHAIRMAN, DEPARTMENTS OF ECONOMICS AND BANKING AND FINANCE, WESTERN RESERVE UNIVERSITY, CLEVELAND, OHIO**

Mr. WELFLING. Mr. Chairman and members of the committee, my name is Weldon Welfling, chairman, Departments of Economics and Banking and Finance, Western Reserve University, Cleveland, Ohio.

Mr. Chairman, the first two pages of my prepared statement are background material with which I am sure the committee is familiar. I can just as well skip that. It is a description of the supply-and-demand situation, with which I am sure you are familiar.

Your committee is meeting in an atmosphere of emergency and urgency and I will try to cooperate by being brief. If in doing so I raise questions I will be glad to try to answer them later.

The current situation presents an excellent opportunity to eliminate silver entirely from the coinage. There seems to be no sound, economic reason to treat the half dollar any differently than the dime and quarter. There is no reason to use an expensive, previous material for any use where a more economical material will serve as well. The Treasury is obviously convinced that the proposed dime and quarter will provide a satisfactory currency in terms of appearance, durability, machine acceptance, difficulty of counterfeiting, and cost. If this is



true, there is no economic reason why the same change should not be made in the half dollar and many reasons why it should. The present bill goes a long way toward solving the silver problem, at least temporarily, but the opportunity should be taken to solve it completely for the foreseeable future.

Even if there were no emergency, logic would dictate making coins as economically as possible. It must be emphasized that fractional coins are purely a convenience. What they are made of, so long as they are truly convenient, is irrelevant. Paper would serve, as it obviously does in dollar bills, except that in small transactions it happens to be less convenient. The silver dime is no better than two nickels or one nickel and five pennies. Ten dimes are no better than a dollar Federal Reserve note, unless, indeed, the price of silver rises above the coinage value. Then, the 10 dimes become more—worth more than a dollar but only as silver, not as coins. Consequently, they become very poor coins as they tend not to circulate at all.

Under present circumstances, it is clearly preferable to eliminate the coinage demand for silver entirely rather than to reduce it. All of the available silver should be mustered to stabilize the market price until the new coinage system is fully operative. Unless this price line is held at least that long, we will be without coins until the new type is in adequate supply.

It is natural that this committee will hear arguments favoring retention of at least some silver in coins. These arguments have little economic validity. Reference is made to “sound” currency. Our convenience coins are sound if they are convenient. The soundness and value of the dollar have nothing to do with whether we make our small change out of silver, copper, nickel, or plastic.

Intrinsic value has nothing to do with the problem. In the first place, nothing has intrinsic value. Value is the result of supply and demand. Reduce the demand for, or increase the supply of, gold, silver, or peanuts and their value will decline. Actually the less so-called intrinsic value a coin has, the better. It costs society less to make, and it is less likely to be used other than as a coin. The market price of the metal in a coin is irrelevant; four quarters were a dollar when silver has cost the Treasury 50, 71, or 92 cents. We certainly do not want full-bodied coins, as they are the most troublesome, as is in fact illustrated now by the silver dollar which has disappeared, and the fractional coins which are threatened by the same fate.

As to the arguments for retaining some silver, other than appeals for intrinsic value, the only ones appear to be tradition and prestige. Under existing circumstances, I see no persuasion in either. The tradition of using silver as a coin in the United States started when silver was used as standard money and was fostered by discoveries of silver many years ago that made it a fairly economical material. Certainly the tradition of using copper must be at least as respectable, dating also from the Mint Act of 1792. As for prestige, I wonder in whose eyes the United States of America gains prestige by using a half dollar that is 40 percent silver. I see more prestige stemming from the advanced technology that has created the sandwich coin and that releases silver for more urgent uses.

May I conclude by referring briefly to some well-known facts about silver. First, silver mining is a minor industry indeed, producing only \$45 million worth—at historically high prices—in the United States annually in recent years. Mexico and Peru both produce more. Annual output of asparagus, cabbage, and celery each exceed domestic output of silver. The silver producing industry has undoubtedly received more favorable attention from Congress, from 1792 to 1964, per dollar of output and per employee than any other industry. Second, only four mines in the United States derive their principal income from silver. Most silver is obtained in conjunction with or as a byproduct of other ores. And against consumption of 326 million ounces in the United States in 1964, production was 36 million ounces, about 11 percent. Third, it follows that high prices of silver benefit mainly foreign producers at the expense of American consumers of photographic supplies, tableware, jewelry, and dental material and as taxpayers paying for the coinage system and for electronic devices. Fourth, it also follows that the price of silver has little effect on output. In spite of the market price rising to \$1.29, American output was 37 million ounces in 1960 and either 35 or 36 million in each subsequent year. Since 1934 the price has risen 80 percent, but annual production is still the same because it is largely tied to output of copper, lead, and zinc. Fifth, and last, silver is just another commodity. It has no inherent, intrinsic claim to be coined any more than does copper or nickel or anything else unless it is the most economical commodity for that use. In today's world, it is more true than ever that silver is too valuable in other uses to be wasted in coins, where other materials are now clearly more economical.

Thank you, Mr. Chairman.

The CHAIRMAN. Thank you, sir.

(The complete statement of Dr. Welfling follows:)

STATEMENT BY DR. WELDON WELFLING, CHAIRMAN, DEPARTMENTS OF ECONOMICS AND BANKING AND FINANCE WESTERN RESERVE UNIVERSITY, CLEVELAND, OHIO

Mr. Chairman and members of the committee, my name is Dr. Weldon Welfling, chairman, Departments of Economics and Banking and Finance, Western Reserve University, Cleveland, Ohio.

Your committee is meeting in an atmosphere of emergency and urgency and I will try to cooperate by being brief. If in doing so I raise questions I will be glad to try to answer them later.

The solution to the coinage problem cannot be delayed much longer. The general nature of the problem has been clear for many months. Industrial demands for silver plus enormous coinage demands in the United States have put upward pressure on the market price of silver. All that prevents the price from rising higher is the Treasury's ability to redeem silver certificates in exchange for silver at the coinage value of \$1.29 per ounce. Estimates vary as to when the Treasury's stock, now down to about a billion ounces, will be depleted but even at present rates it will be exhausted in 2 years. As this point is approached, the more rapidly will the stock be depleted.

In 1964, free-world production of silver amounted to 215 million ounces, only 36 million coming from the United States. The United States alone used 203 million ounces in coinage, with other nations using 61 million, for a total of 264 million ounces. Industrial consumption was 123 million in the United States, 163 million abroad, and a total of 286 million ounces. Coinage and industrial uses each exceeded total output. Output amounted to 40 percent of consumption. The other 60 percent came from accumulated stocks.

An unknown but significant fraction of the demand is undoubtedly speculative. When the Treasury is no longer able to supply the market the price will be free to rise above \$1.29. When it reaches \$1.38 the silver in dimes, quarters,



and halves will make them full-bodied money, and at higher prices these coins can be melted for the metal.

Such experiences have happened twice before in our history. In Andrew Jackson's time the price of silver was pushed up above \$1.29 and fractional coins disappeared. The eventual remedy was the Subsidiary Coinage Act of 1853, which was the first legislative recognition of the fact that fractional coins need not be full bodies. However, the silver content was reduced only about 7 percent, which gives us the \$1.38 figure. During the Civil War the price of silver rose by this 7 percent and more, and again coins were melted while the Treasury was unable to buy more silver. Both of these periods illustrated the great inconvenience of not having a workable system of coins, and today the inconvenience would be far greater with our vending machines, coin-operated machines, telephones, toll booths, and so on.

Since the 1870's, silver supply and demand have been such as to keep the price below the silver dollar equivalent of \$1.29. In fact, at times the price has been a quarter of that figure or less. Only a variety of price support programs in form of coinage laws, going all the way back to the Bland-Allison Act of 1878, has kept the price from being lower. Today, however, the situation is reversed, and demand far exceeds supply at \$1.29.

The current situation presents an excellent opportunity to eliminate silver entirely from the coinage. There seems to be no sound, economic reason to treat the half dollar any differently than the dime and quarter. There is no reason to use an expensive, precious material for any use where a more economical material will serve as well. The Treasury is obviously convinced that the proposed dime and quarter will provide a satisfactory currency in terms of appearance, durability, machine acceptance, difficulty of counterfeiting, and cost. If this is true, there is no economic reason why the same change should not be made in the half dollar and many reasons why it should. The present bill goes a long way toward solving the silver problem, at least temporarily, but the opportunity should be taken to solve it completely for the foreseeable future.

Even if there were no emergency, logic would dictate making coins as economically as possible. It must be emphasized that fractional coins are purely a convenience. What they are made of, so long as they are truly convenient, is irrelevant. Paper would serve, as it obviously does in dollar bills, except that in small transactions it happens to be less convenient. The silver dime is no better than two nickels or one nickel and five pennies. Ten dimes are no better than a dollar Federal Reserve note, unless, indeed, the price of silver rises above the coinage value. Then, the 10 dimes become worth more than a dollar but only as silver, not as coins. Consequently, they become very poor coins as they tend not to circulate at all.

Under present circumstances, it is clearly preferable to eliminate the coinage demand for silver entirely rather than to reduce it. All of the available silver should be mustered to stabilize the market price until the new coinage system is fully operative. Unless this price line is held at least that long, we will be without coins until the new type is in adequate supply.

It is natural that this committee will hear arguments favoring retention of at least some silver in coins. These arguments have little economic validity. Reference is made to "sound" currency. Our convenience coins are sound if they are convenient. The soundness and value of the dollar have nothing to do with whether we make our small change out of silver, copper, nickel, or plastic.

Intrinsic value has nothing to do with the problem. In the first place, nothing has intrinsic value. Value is the result of supply and demand. Reduce the demand for, or increase the supply of, gold, silver, or peanuts and their value will decline. Actually the less so-called intrinsic value a coin has, the better. It costs society less to make, and it is less likely to be used other than as a coin. The market price of the metal in a coin is irrelevant; four quarters were a dollar when silver has cost the Treasury 50 cents, 71 cents, or 92 cents. We certainly do not want full-bodied coins, as they are the most troublesome, as is in fact illustrated now by the silver dollar which has disappeared, and the fractional coins which are threatened by the same fate.

As to the arguments for retaining some silver, other than appeals for intrinsic value, the only ones appear to be tradition and prestige. Under existing circumstances, I see no persuasion in either. The tradition of using silver as a coin in the United States started when silver was used as standard money and was fostered by discoveries of silver many years ago that made it a fairly economical material. Certainly the tradition of using copper must be at least as respectable, dating also from the Mint Act of 1792. As for prestige, I wonder in whose eyes

the United States of America gains prestige by using a half dollar that is 40 percent silver. I see more prestige stemming from the advanced technology that has created the sandwich coin and that releases silver for more urgent uses.

May I conclude by referring briefly to some well-known facts about silver. First, silver mining is a minor industry indeed, producing only \$45 million worth—at historically high prices—in the United States annually in recent years. Mexico and Peru both produce more. Annual output of asparagus, cabbage, and celery each exceed domestic output of silver. The silver-producing industry has undoubtedly received more favorable attention from Congress, from 1792 to 1964, per dollar of output and per employee than any other industry. Second, only four mines in the United States derive their principal income from silver. Most silver is obtained in conjunction with or as a byproduct of other ores. And against consumption of 326 million ounces in the United States in 1964, production was 36 million ounces, about 11 percent. Third, it follows that high prices of silver benefit mainly foreign producers at the expense of American consumers of photographic supplies, tableware, jewelry, and dental material and as taxpayers paying for the coinage system and for electronic devices. Fourth, it also follows that the price of silver has little effect on output. In spite of the market price rising to \$1.29, American output was 37 million ounces in 1960 and either 35 or 36 million in each subsequent year. Since 1934 the price has risen 80 percent, but annual production is still the same because it is largely tied to output of copper, lead, and zinc. Fifth, and last, silver is just another commodity. It has no inherent, intrinsic claim to be coined any more than does copper or nickel or anything else unless it is the most economical commodity for that use. In today's world, it is more true than ever that silver is too valuable in other uses to be wasted in coins, where other materials are now clearly more economical.

The CHAIRMAN. Now, you say the rest of the gentlemen will file their statements?

Mr. STEVENS. Mr. Chairman, I think I erred a bit in that. All of the individuals here, with one exception, represent the Silver Users Association, and I cannot speak for Mr. Morris, who does not sit here as a representative of the Silver Users.

The CHAIRMAN. Yes, sir.

Mr. Morris, you have a statement too?

Mr. MORRIS. Yes.

#### STATEMENT OF JOSEPH T. MORRIS, MANAGING DIRECTOR, NATIONAL ASSOCIATION OF PHOTOGRAPHIC MANUFACTURERS, INC.

Mr. MORRIS. Mr. Chairman, I would like to make a statement, excerpting from both a summary and written statement.

I would also like to ask in the interest of conserving this committee's time that this brochure entitled "Photography and the Economy" be included in the record. It has been distributed to the members of the committee.

The CHAIRMAN. Yes; I have looked at it. It contains interesting information, we will insert it in the appendix. Without objection, it is so ordered.

Now, Mr. Morris, you may present your statement, sir.

Mr. MORRIS. Thank you, Mr. Chairman, members of the committee—my name is Joseph T. Morris. I am managing director of the National Association of Photographic Manufacturers, Inc., New York, N.Y., a voluntary association composed of approximately 80 U.S. companies engaged in the manufacture of photographic film and papers, cameras, projectors, and other equipment and photographic chemicals. Its members account for over 90 percent of these products manufactured in the United States, dollar and volume wise.



The U.S. photographic manufacturing industry is the largest industrial user of silver in the world. We, therefore, greatly appreciate this opportunity to express our views on the proposed legislation, H.R. 8746, presently being considered by this distinguished committee.

The photographic industry is entirely dependent upon systems for image reproduction that utilize silver-based salts. There are no satisfactory alternates or substitutes for silver in the photographic process and, despite extensive research, there are no technological changes to nonsilver systems anticipated.

There has been extensive research aimed at the development of substitutes for silver-based salts. This research has been accelerated within the past few years in part as a direct result of the substantial increase in the cost of silver which has occurred since 1961. Silver represents a considerable portion of the cost of sensitized photographic products. Yet, despite an increase in silver prices of over 40 percent in the past 4 years, no acceptable substitute system has been devised and none is foreseeable.

To date any material discovered is subject to severe limitations and would at best be suitable for extremely limited applications.

As the photographic industry has grown, its needs for silver has increased from 30.8 million ounces in 1959 to 40.3 million ounces in 1964. It is expected that this demand will continue to increase as the industry continues to expand within the economy.

Because of its extensive use of silver, the photographic industry has developed an awareness of the need for silver recovery, both as a conservation measure and as a measure of prudent business economy. Those companies in the industry engaged in the manufacture of photographic films and papers recover the maximum amount of silver possible from waste and scrap materials. Silver is also recoverable from the solutions used in the development process for photographic films and papers. During processing, a varying amount of silver is "washed" from the film or paper and remains in the solution. The extraction of this silver from photographic chemicals is practiced by many companies in the industry. Since this recovery requires an investment in capital equipment, labor, and overhead, the economy of silver recovery in the process operation is dependent upon the volume of film processed and many other factors.

The members of the association and of the photographic industry have a direct and continuing interest in insuring that the supply of silver available for this use is maintained. They, therefore, have a further direct interest in any proposed legislation that attempts to deal with the present critical deficit situation existing between free world silver production and consumption.

The proposed legislation under consideration by this committee provides for the elimination of silver in U.S. dimes and quarters. We enthusiastically support this portion of the proposed bill.

The members of the association are unalterably opposed to that portion of the proposed legislation that would provide for the continued use of silver in U.S. half dollars, even on a reduced silver-content basis.

In 1964 the free world deficit between silver consumption and production excluding all coinage demand was 70.4 million ounces. Any continued use of silver in U.S. subsidiary coinage can only increase this deficit and reduce the total amount of silver available for private

industry where its use is vital to the continued growth of the economy.

President Johnson, in his message to the Congress of June 3, 1965, accompanying the proposed legislation, states the following:

In terms of the present pattern of coin usage, adoption of the new coinage will permit a saving of some 90 percent of the silver we are now putting into coins annually.

This would indicate a contemplated continuing demand for over 30 million ounces of silver to be used in half dollars based on the 300-million-ounce estimate for present consumption elsewhere stated in his message. The continued use of 30 million ounces of silver in coinage represents an almost 50-percent increase in the 1964 industrial arts freeworld deficit of consumption over production. Otherwise stated, this continued unnecessary demand for silver in half dollars represents approximately 75 percent of the silver used by the entire U.S. photographic industry last year, based on the consumption reported in the Treasury study.

We appreciate this opportunity to appear before this distinguished committee and present our views on a legislative proposal which has such far-range implications for our industry and for our Nation as a whole. Thank you.

The CHAIRMAN. Thank you, sir.

(The complete statement of Mr. Morris follows:)

#### STATEMENT ON BEHALF OF THE NATIONAL ASSOCIATION OF PHOTOGRAPHIC MANUFACTURERS, INC.

My name is Joseph T. Morris. I am managing director of the National Association of Photographic Manufacturers, Inc., New York, N.Y., a voluntary association composed of approximately 80 U.S. companies engaged in the manufacture of photographic film and papers, cameras, projectors, and other equipment and photographic chemicals. Its members account for over 90 percent of these products manufactured in the United States, dollarwise and volumewise.

The U.S. photographic manufacturing industry is the largest industrial user of silver in the world. We, therefore, greatly appreciate this opportunity to express our views on the proposed legislation, H.R. 8746, presently being considered by this distinguished committee.

#### SUMMARY

In 1964 the U.S. photographic manufacturing industry's usage of silver was estimated at 40.3 million ounces.<sup>1</sup>

The photographic industry is entirely dependent upon systems for image reproduction that utilize silver-based salts. There are no satisfactory alternates or substitutes for silver in the photographic process and, despite extensive research, there are no technological changes anticipated to nonsilver systems.

The members of the association and of the photographic industry have a direct and continuing interest in insuring that the supply of silver available for this use is maintained. They, therefore, have a further direct interest in any proposed legislation that attempts to deal with the present critical deficit situation existing between free world silver production and consumption.

The proposed legislation under consideration by this committee provides for the elimination of silver in U.S. dimes and quarters. We enthusiastically support this portion of the proposed bill.

The members of the association are unalterably opposed to that portion of the proposed legislation that would provide for the continued use of silver in U.S. half dollars, even on a reduced silver-content basis.

In 1964 the free world deficit between silver consumption and production, excluding all coinage demand was 70.4 million ounces.<sup>2</sup> Any continued use of silver in U.S. subsidiary coinage can only increase this deficit and reduce the total

<sup>1</sup> Treasury Staff Study of Silver and Coinage, U.S. Treasury Department.

<sup>2</sup> Table 1. Treasury Staff Study of Silver and Coinage, U.S. Treasury Department.



amount of silver available for private industry where its use is vital to the continued growth of the economy.

President Johnson, in his message to the Congress of June 3, 1965, accompanying the proposed legislation, states the following: "In terms of the present pattern of coin usage, adoption of the new coinage will permit a saving of some 90 percent of the silver we are now putting into coins annually." This would indicate a contemplated continuing demand for over 30 million ounces of silver to be used in half dollars based on the 300-million-ounce estimate for present consumption elsewhere stated in his message. The continued use of 30 million ounces of silver in coinage represents an almost 50-percent increase in the 1964 industrial-arts free world deficit of consumption over production. Otherwise stated, this continued unnecessary demand for silver in half dollars represents approximately 75 percent of the silver used by the entire U.S. photographic industry last year, based on the consumption reported in the Treasury study.

Photography is a basic industry in the Nation's economy.

#### *Photography dependent upon silver availability*

The entire photographic process depends upon the unique ability of a silver salt to record an image when exposed to light. Photographic film and paper reproduce an image because they have been coated with a light-sensitive silver salt. No other material has been discovered that can produce the quality of image and continuous tones that make a photograph come alive.

There has been extensive research aimed at the development of substitutes for silver-based salts. This research has been accelerated within the past few years in part as a direct result of the substantial increase in the cost of silver which has occurred since 1961. Silver represents a considerable portion of the cost of sensitized photographic products. Yet, despite an increase in silver prices of over 40 percent in the past 4 years, no acceptable substitute system has been devised and none is foreseeable.

To date any material discovered is subject to severe limitations and would at best be suitable for extremely limited applications.

As the photographic industry has grown, its need for silver has increased from 30.8 million ounces in 1959 to 40.3 million ounces in 1964.<sup>3</sup> It is expected that this demand will continue to increase as the industry continues to expand within the economy.

Because of its extensive use of silver, the photographic industry has developed an awareness of the need for silver recovery, both as a conservation measure and as a measure of prudent business economy. Those companies in the industry engaged in the manufacture of photographic films and papers recover the maximum amount of silver possible from waste and scrap materials. Silver is also recoverable from the solutions used in the development process for photographic films and papers. During processing, a varying amount of silver is "washed" from the film or paper and remains in the solution. The extraction of this silver from photographic solutions is practiced by many companies in the industry. Since this recovery requires an investment in capital equipment, labor, and overhead, the economy of silver recovery in the process operation is dependent upon the volume of film processed and many other factors.

Our industry is concerned over the existing deficit between free-world industrial consumption and free-world silver production. Because silver is indispensable to the photographic process, we are vitally interested in the conservation of existing silver stocks to forestall the time when the lack of available silver at any price could cause a serious curtailment in the manufacture of our industry's products.

If silver supplies are curtailed, vital uses of film in the defense effort where, for example, it is indispensable in aerial reconnaissance, would be continued at greatly increased costs to the Government and taxpayer.

Since the Government is the largest purchaser of sensitized photographic material, the burden would be substantial. Medical, dental, and scientific research would continue to require film. Banks and other commercial and industrial users where photography is necessary for recordkeeping, product analysis, and research would have a continuing need. Newspapers, magazines, and other periodicals where graphic arts represents the lifeblood would be supplied, but all would face mounting prices and reduced supply. Many amateur photographers faced with increased costs would cut back their photographic expenditures or possibly be forced to turn to other interests.

<sup>3</sup> Table 4. Treasury Staff Study of Silver and Coinage, U.S. Treasury Department.

*The effect of the proposed legislation*

The proposed legislation under consideration by this committee is a recognition in part of the continuing need of private industry for silver underscored by the statement of the President in his message to the Congress on June 3, 1965, accompanying the proposed bill in which he stated, "The one part of the demand for silver that can be reduced is Governmental demand for use in coinage."

The elimination of silver in dimes and quarters as proposed, represents a realistic partial solution to the excessive demand placed upon Treasury stocks of silver by the continued use of silver in our subsidiary coinage and furthermore, a recognition that subsidiary coinage need not have "intrinsic value" to maintain purchasing power.

Silver has become too valuable to the industrial needs of our economy to be continued in any subsidiary coinage. Our members and our industry, therefore, are opposed to that portion of the proposed bill which would provide for the retention of a reduced amount of silver in U.S. half dollars. The continued use of silver in half dollars will impose an unnecessary and unwarranted burden upon Treasury stocks detracting from their availability to aid in filling the industrial deficit and assisting in the orderly transition to nonsilver subsidiary coinage. Inevitably, these stocks will become depleted necessitating a second change in the composition of the U.S. half dollars. The Battelle Memorial Institute study indicates that this might occur in the 1970's.

Assistant Secretary of the Treasury Wallace in testimony before a subcommittee of the Committee on Appropriations, U.S. House of Representatives on May 24, 1965, indicated in discussing the subsidiary coin shortage that "the shortage of half dollars continues to be very severe." The testimony which followed indicates that the Treasury attributes this shortage to the fact that the Kennedy half dollar has become a collector's item. The minting of this coin with a reduced silver content—with an ultimate realization that a further change to nonsilver composition is inevitable, can have only one result, to further decrease the circulation of this coin.

President Johnson, in his message to the Congress of June 3, 1965, accompanying the proposed legislation, states the following: "In terms of the present pattern of coin usage, adoption of the new coinage will permit a saving of some 90 percent of the silver we are now putting into coins annually." This would indicate a contemplated continuing demand for over 30 million ounces of silver to be used in half dollars based on the 300-million-ounce estimate for present consumption elsewhere stated in his message. The continued use of 30 million ounces of silver in coinage represents an almost 50-percent increase in the 1964 industrial arts free-world deficit of consumption over production. Otherwise stated, this continued unnecessary demand for silver in half dollars represents approximately 75 percent of the silver used by the entire U.S. photographic industry last year based on the consumption reported in the Treasury study.

*Photography in the economy*

The photographic industry employs approximately 300,000 persons in the United States. There are over 200,000 retail outlets which sell over \$2½ billion of photographic products at consumer purchase value. In 1963, 530 photographic manufacturing establishments had shipments of over \$1.8 billion at manufacturers prices. In 1964 exports of photographic goods amounted to \$180 million against imports of \$110 million, a significant contribution to the U.S. balance-of-payments situation.

Approximately two-thirds of the sales by the U.S. photographic manufacturing industry are to Government, industry, and commercial users. To this large segment of the economy, the continued use of photography is vital. In national defense where it is used for aerial reconnaissance and X-ray examination of our weapons systems, to the health of our citizens where half a billion medical and dental X-rays last year contributed significantly to the health of our population, to the printing and publishing industries where photography pictorially tells a story and, in addition, is finding increasing usage as a modern production technique.

To education where 340,000 still and movie projectors are in use in the U.S. public schools, and to science and industry where it performs a wide variety of tasks ranging from data storage to use in oil exploration.

Photography also provides recreation for some 52 million American picture takers as well as through motion pictures.



## CONCLUSION

We appreciate this opportunity to appear before this distinguished committee and present our views on a legislative proposal which has such far-range implications for our industry and for our Nation as a whole.

We respectfully urge the committee to report the proposed legislation so as to provide for the complete elimination of silver in our Nation's subsidiary coinage and simultaneously to insure to the maximum extent possible the continued availability of silver to meet the growing needs of the economy.

(The statements of Mr. Francis H. Wemple, and Mr. George R. Frankovich follow:)

## STATEMENT OF FRANCIS H. WEMPLE, TREASURER OF HANDY &amp; HARMAN

I am Francis H. Wemple, treasurer of Handy & Harman, a New York corporation founded 98 years ago in 1867. Our executive offices are at 850 Third Avenue, New York, N.Y., and we have plants in Fairfield, Conn.; Mount Vernon, N.Y.; Providence, R.I.; Chicago, Ill.; El Monte, Calif.; Norristown, Pa.; and Toronto, Ontario, Canada. In addition, we have sales offices in other major cities both in the United States and Canada, and an important volume of our products is sold through distributors who have hundreds of branches all over the country.

Among other activities, we are one of the world's largest processors and refiners of silver for industry. We are manufacturers, not bullion dealers in the sense of merely buying and selling silver in the form of commercial bars. We produce a wide range of silver products made from alloys and compositions which are used in virtually all lines of industry throughout the United States and Canada. We also buy scrap materials containing silver for our own use or for return to our customers.

Handy & Harman endorses those provisions of H.R. 8746 which deal with the minting of quarters and dimes without silver. We strongly oppose section 1(a)(1) calling for a half dollar containing silver and section 7 establishing a mandatory Treasury purchase price of \$1.25 an ounce for newly mined domestic silver.

We oppose the proposed silver half dollar on the grounds that in our opinion there is a shortage of silver for industrial purposes alone which should not be aggravated by the retention of any silver in our subsidiary coinage system. The existence of this shortage and the reasons for it are clearly stated in the President's message of June 3, and are in fact given as the primary reasons for recommending the elimination of silver from the quarter and the dime. In my opinion the same considerations with respect to the elimination of silver from the quarter and the dime apply equally to the half dollar.

We oppose the establishment of a mandatory Treasury buying price for newly mined domestic silver because we believe that it is thoroughly unjustified and is a complete reversal of the Government's silver policy clearly established in Public Law 88-36 passed just 2 years ago.

The continued availability of silver at reasonable prices is vital to the industry which my company and others like us serve. It is a common misunderstanding to think of jewelry and silverware as the largest users of silver. In fact President Johnson in his June 3 message listed these categories first in discussing private demand for silver. Actually these uses account for only about 20 percent of total industrial demand in the United States. The largest single industrial use is photography, and this involves not just snapshots but also X-ray film, industrial photography, as well as defense photography. In the consumer products group silver is used in all household appliances, in automobiles, in radios, in television sets, and in telephones to name just a few. The mirror industry is also a very large user. Heavy industry relies on silver for motors and generators, aircraft, atomic reactor control rods, agricultural machinery, switches and controls, electronic data processing equipment, and a host of other products. Silver is used in dentistry, as silver amalgam for fillings, and for medical compounds. It is used in X-ray tubes and equipment and in surgical and medical appliances. In the defense industry it is essential for submarine and torpedo batteries, marine plumbing, rockets and missiles, supersonic aircraft, and radar. In most of these areas no substitute for silver exists. It is essential to support our economy as we know it. The President himself states that coinage is the one part of demand for silver that can be reduced. I go further and maintain that coinage is the one part of demand for silver that can and should be eliminated.

Everyone is familiar with the fact that demand for silver, particularly for coinage in the United States, has grown very rapidly during the past few years.

Attached to this statement are two charts, one showing the widening gap between demand and new production and the other showing the rising price trend for silver over the past several years. I am also attaching a copy of Handy & Harman's Review of the Silver Market for 1964 which describes in detail historical developments in the silver market. All of these background facts were brought out in the President's coinage message. (The review referred to above may be found in the appendix.)

In considering the merits of a silver half dollar we must estimate future demand and supplies of silver. To do this I am making some basic assumptions. These are:

1. That production in the free world will increase over the next 5 years by a cumulative total of approximately 35 percent. I arrive at this figure by studying the most optimistic estimate of the American Mining Congress. It may prove to be unrealistic. It is based on the assumption that higher prices will bring about substantially higher production. This is not necessarily true. Production in the United States in 1964 was just about the same as it was in 1960, in spite of a price increase of about 40 percent. Sunshine Mine, for example, reported production in 1964 of 2,700,000 ounces compared to an average production for the past 5 years of over 3 million ounces.

2. That industrial consumption in the free world will increase by about 25 percent over the next 5 years. This is slightly less than the increase over the past 5 years and may be understated.

3. That coinage demand will decrease sharply due to the proposed new coinage for the United States and less usage outside the United States. For the United States I am using a figure of 30 million ounces based on the assumption in President Johnson's message that the proposed change would reduce the current annual usage of 300 million ounces by 90 percent. I am assuming further that all other countries combined will not be using more than another 30 million ounces, even though they used over 60 million ounces last year.

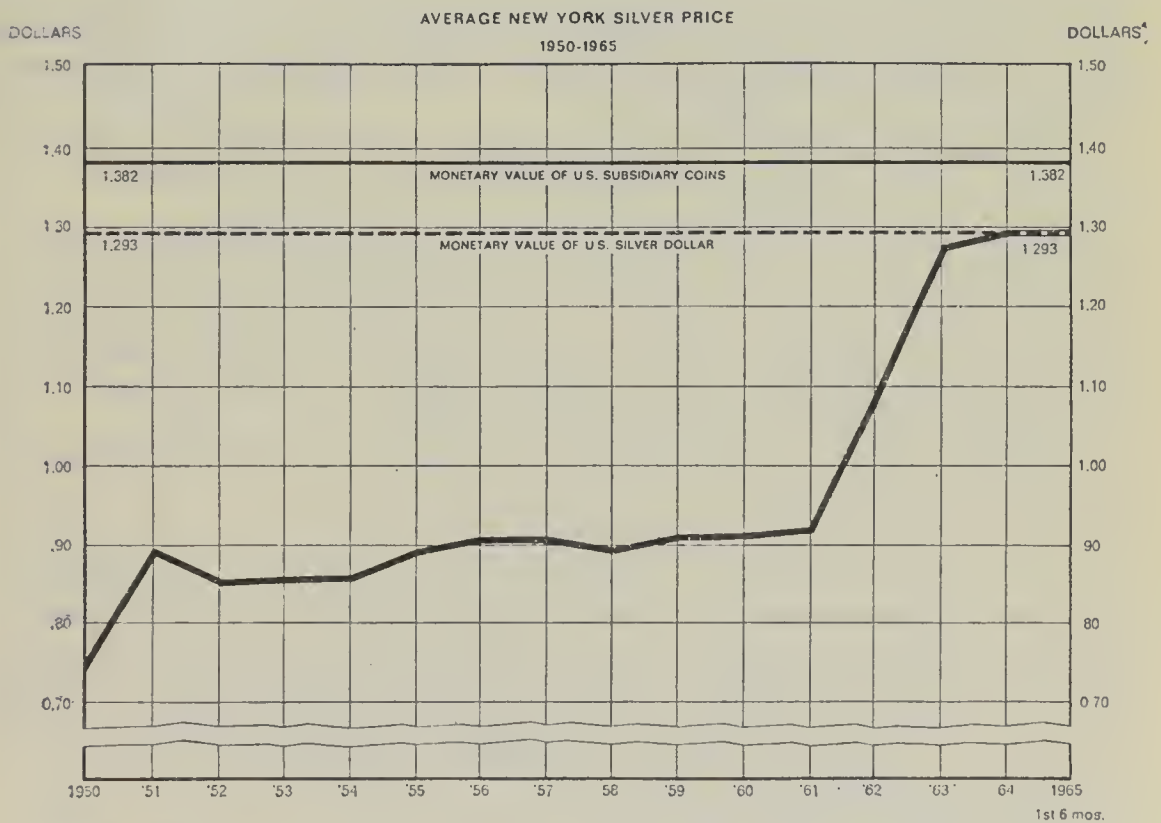
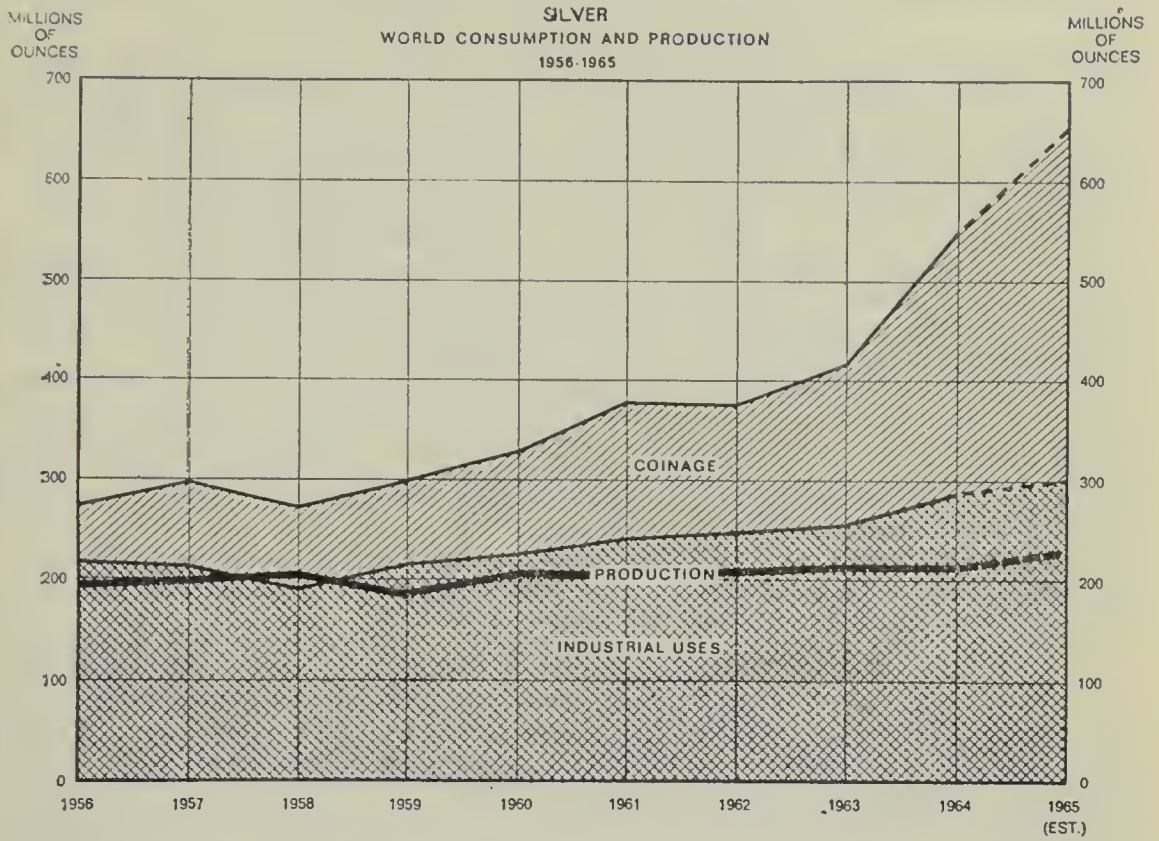
Using these assumptions we can project by 1970 world industrial demand at about 360 million ounces and coinage demand at about 60 million ounces. New production would be about 290 million ounces, leaving a worldwide deficit of some 130 million ounces. Secondary sources cannot even optimistically be expected to supply more than 50 million ounces, so this would mean that 5 years from now there would be an annual deficit of some 80 million ounces.

Let's examine the Treasury stock situation by 1970. According to the President's message the new coins will not go into circulation until sometime in 1966. Therefore we may assume that mid-1966 may be the time. Treasury stocks now amount to about 1 billion ounces. At the present rate of use they will be down to about 580 million ounces by the middle of next year. After deducting the proposed stockpile of 135 million ounces, there would be less than 450 million ounces left, which at the present rate of redemptions as well as projected use for half dollars would be gone before 1970. In order to get silver for the new half dollar the Treasury would then have to rely on silver obtained from getting our present coin back out of the hands of the public, or it would have to go to the marketplace to buy it.

There is a lot of silver outstanding in the form of existing coins, but, as I understand the administration's proposal, these coins will have to continue circulating alongside the new coins for some time. Furthermore, how fast they can be withdrawn in the future is unpredictable. If the Treasury tried to buy 30 million ounces a year in a market where supplies were already short, unquestionably substantially higher prices would result with consequent serious damage to many, many industries.

We conclude that the proposed silver half dollar will only intensify the existing silver shortage. It will not stay in circulation because it will be even more of a curiosity and collectors' piece than the present half dollar which disappeared as fast as it has been minted. It will assuredly have to be changed again in the future, and this can only cause further disruptions and inconvenience. We conclude further that the same silver shortage which dictates the removal of silver from our subsidiary coins, including the half dollar, makes completely illogical the establishment of a Treasury buying price for newly mined domestic silver at \$1.25 an ounce.





## STATEMENT BY GEORGE R. FRANKOVICH, EXECUTIVE DIRECTOR, MANUFACTURING JEWELERS &amp; SILVERSMITHS OF AMERICA, INC.

My name is George R. Frankovich. I am the executive director of the Manufacturing Jewelers & Silversmiths of America, Inc., the principal trade association of the manufacturing jewelry and silverware industry in this country. This association has about 500 manufacturers of jewelry, silverware, and allied products in its membership, including suppliers to manufacturing plants.

Silver is an important metal to our membership. Half of our finished goods manufacturers use silver. Several dozen members are totally dependent on silver as a raw material. Their products include men's and women's jewelry, religious articles, school and college rings, identification bracelets, and tableware. Most of these manufacturers are small, with little capability to diversify their production, their markets, or their raw material requirement.

These silver-using manufacturers are just emerging from the chaotic silver price increases of several years ago that made shambles of their pricing structure. Particularly hard hit were those whose product prices were frozen for long periods; for example, those selling on long-term contracts and through catalogs. These past few years have demonstrated the necessity of obtaining some assurance of stability in the price of their raw material. They are prepared to assume the normal risks of a free commodity market, but they do not consider justified the competition from Government for the use of silver in coins or the continued adverse influence by Government on supply and price.

In jewelry alone, there are about 1,200 persons whose livelihood depends on silver. Silverware accounts for about 13,000 additional jobs. Historically, as well as pricewise, silver products occupy a unique niche in the market. Most silver jewelry sells more because it is silver than because it is jewelry. If silver were to become uneconomic to obtain, a gap would appear in the jewelry and tableware markets and much of this gap would never be filled by products of other materials. While some persons may be unsympathetic to the uses of silver in products of this type, the thousands of jobs silver makes possible in our industry are vitally important to those who earn their living with this metal. Vital to our economy, too, are the businesses and communities whose welfare is closely linked to silver.

Obviously, we agree with the simple logic that silver be eliminated in dimes and quarters because of the silver shortage and increasing coinage requirements. But to make half dollars of 40 percent silver content under these circumstances simply does not make economic or monetary sense. Such action darkens even further the serious silver supply outlook.

Projections of stockpile requirement, coinage for the rest of 1965, and continued redemption of silver certificates at the present rate would shrink our silver stocks to about 400 million ounces by the end of this year.

Increased silver production falls short of the increasing industrial demand. So even without silver in half dollars, a continuing free-world deficit of 75 million ounces would sop up a 400-million-ounce reserve in about 5 years.

That certainly is a dark outlook. But coinage of half dollars of 40-percent silver would shorten the life of even that small reserve by 1 or 2 years, depending on whether Secretary Fowler's low estimate is used or whether we assume the more realistic 1964 production figures for half dollars.

An additional year or two of silver price stability makes a big difference to the consumer and to the manufacturer of silver products. More important, however, is the seemingly permanent competition from the mint for scarce silver stocks, which is inevitable if the bill in its present form is enacted.

The arguments for silver in the half dollar are tortuous at best. Our "prestige" money is the American dollar and it shall continue to be so long as we maintain its prestige. As long as people accept 2 half dollars, or 4 quarters, or 10 dimes for this dollar, we have good coins, regardless of the material from which they are made. If the Treasury doubts that 4 quarters or 10 dimes of a nonsilver material will continue to be change for a dollar, H.R. 8746 may fail to ease our coinage problem. If it believes, however, as do we, that the nonsilver quarter and dime will keep their acceptable positions as subsidiary coins, then it can only follow that so would a nonsilver half dollar.

We urge that this committee amend the present bill to provide half dollars of non-silver-bearing material.

The CHAIRMAN. We will now give the members an opportunity to ask questions. Mr. Multer?



Mr. MULTER. Mr. Chairman, if it is agreeable, I would like to yield my time to Mr. White.

The CHAIRMAN. Mr. Multer, we cannot yield time very well and carry out our program as we have agreed upon. If you——

Mr. MULTER. I will pass at this time, Mr. Chairman.

The CHAIRMAN. Mr. Barrett?

Mr. BARRETT. No questions.

The CHAIRMAN. Mr. Brock?

Mr. BROCK. I will pass for the moment, Mr. Chairman.

The CHAIRMAN. Mrs. Sullivan?

Mrs. SULLIVAN. I find myself pretty much in agreement with these gentlemen, Mr. Chairman, so I am going to pass for the moment.

The CHAIRMAN. Mr. Reuss?

Mr. REUSS. Dr. Welfling, you said that there are only four silver mines in the United States that derive their principal income from silver. What are the names of those four mines and where are they?

Mr. WELFLING. I think all four are in Idaho. This information was in the Treasury's recent study—where the mines are listed and named.

Mr. REUSS. Can you answer that, Mr. Strauss?

Mr. STRAUSS. Yes; may I comment on that.

What the Department of the Interior said was of the 25 largest silver producers in the United States, only 4 were silver mines. There are a substantial number of small mines, not ranking in the 25 largest producers, which have silver as their principal product. But to name the four mines that the Treasury referred to as silver mines, I believe these are the Sunshine, the Galena mine, in which my company has an interest, the Lucky Friday mine, where silver is the chief element of value, although there is a substantial production of base metals, and the Crescent mine. I believe these are the four that are listed in the 25.

Mr. REUSS. Going beyond the first 25 mines, how many additional mines now operating are there whose principal income is derived from silver.

Mr. STRAUSS. I would have to make a stab at that, Mr. Reuss. I would say there are probably 30 or 40 small mines scattered through Idaho, Nevada, Colorado, and so on that are dependent chiefly on silver. Of course, our point of view, if I may say so, is that the reason there are so few mines where silver is the chief element of revenue is that in spite of the fact that there has been an 80-percent increase in the price of silver, as has been commented on here, the prices of other commodities have risen by considerably more than 80 percent.

For instance, in the case of all metals and metal products, the Bureau of Labor Statistics figures show that the increase over the same period of time—that is, since the end of the war—has been something like 140 percent. The wages paid to metal miners, based on some figures developed by the National Industrial Conference Board, have approximately tripled during this period.

So that when you talk about an 80-percent increase in silver prices, you have got to correlate that to the inflationary process that has been going on in the whole economy.

Mr. REUSS. Thank you, Mr. Chairman.

The CHAIRMAN. Mr. Johnson?

Mr. JOHNSON. Thank you, Mr. Chairman.

Apparently what we are really discussing here this morning is the question of whether we will eliminate the 50-cent piece from the legislation and put it in the same category as other coins.

I am interested in the statement this morning by Mr. Strauss, and I want to direct this to any member of the panel, in which he says "we believe the lesson of history is clear that currency systems based exclusively on fiat money are in the long run doomed to drastic devaluation."

Do you think that it will be a dangerous thing for the coinage of this country and to our monetary system if we also destroy the silver content in our 50-cent piece and just have all coins just token coins? Do you believe that statement? That is a pretty strong statement by Mr. Strauss—warning of a monetary disaster if we resort to nothing but token coins.

Would you care to answer it, Mr. Stevens?

Admiral RAMSEY. I think Dr. Welfling would be the one to answer that question.

Mr. WELFLING. Excuse me, I thought you were addressing a question to Mr. Strauss.

Mr. JOHNSON. No; I was quoting Mr. Strauss and addressing my question to your panel.

Mr. WELFLING. I am sorry.

No; I would disagree completely.

As I said in my statement, it could not matter less what token coins are made out of. In fact, the name "token coin" explains the situation. They are tokens. As such my position would be they should be made as economically as possible.

What the token coins are made of has nothing whatever to do with the so-called soundness of the dollar or the level of the price level.

Mr. JOHNSON. Thank you.

That is all, Mr. Chairman.

The CHAIRMAN. Mr. Brock?

Mr. BROCK. Will the gentleman yield?

Just following that thought further, Doctor, would you then take the position that the dollar itself should have no reserves behind it?

Mr. WELFLING. As a quick answer, I could not quite take that position; no. I would explain my answer this way: The value of the dollar, meaning the height of the price level, is determined largely by the volume of dollars. How many of those dollars the public wants to carry around in fractional form is purely a matter of convenience, once the total quantity of dollars has been fixed by monetary policy.

Mr. BROCK. I agree completely insofar as the coinage is concerned. I was just wondering about your economic philosophy in general insofar as the gold backing is concerned.

Mr. WELFLING. I would have to say how the supply of dollars is limited is less important than the fact that it is limited, whether it is limited by gold reserves or some other method.

The CHAIRMAN. Mr. Stephens?

Mr. STEPHENS. I would like to ask anybody on the panel that might feel he would like to volunteer an opinion on this. It seems to me when we take the silver out of all the coins, as you have proposed, including the major portion out of the 50-cent piece, too, that



collectors and people who are not collectors in the true sense will have a tendency to hold onto coins that have as much as 90 percent silver in them, and you will find retired from circulation every silver coin. I just wondered if that would not be true.

Admiral Ramsey, would you like to comment on that?

Admiral RAMSEY. Mr. Stephens, that has been one of the bones of contention, if I may put it that way, between the silver-using industry and the silver-producing industry, as to which action will cause the coins to disappear the fastest.

Well, we do not think what you have in mind will happen for this reason.

There is a speculative interest in silver coins existing today in anticipation of a price rise in silver which would make the silver coins more valuable for their metal content than the face value.

We feel that this speculative interest has been kept up by uncertainty and the prophecies that the price of silver would rise.

We feel that if silver is eliminated from coins altogether, and this speculative interest is eliminated, that people will not be inclined to hoard silver coins when they might spend them, and they might use them for more useful purposes than holding them in speculation, waiting for the price to rise.

Now, we do feel that there will be some increase in collecting or hoarding or whatever you want to call it. There is bound to be. There is to be a change in our coinage system, and some people will say "Well, these coins are not going to be minted any more, perhaps we had better empty our pockets every night and put them in a box." This is to be expected.

But the people who are holding, as one of the members I think yesterday said, he had knowledge of someone who is holding 1½ tons of silver coins in anticipation of a price rise, he would no longer continue to hold these coins if he did not think he was going to make a profit.

Therefore we think that the elimination of silver will tend to bring coins back into circulation, because the speculative interest is gone.

Mr. STEPHENS. Would that speculative interest be part of the reason that the Kennedy half dollars have not been in general circulation?

Admiral RAMSEY. Well, sir, the Kennedy half dollar is in effect a commemorative coin, and I do not think you can include it in the speculative area. The Kennedy half dollar is a commemorative coin, in effect, and it is being kept by people for that reason and not for a speculative interest in the hopes that they will get more money for the 50-cent piece.

Mr. STEPHENS. That is all that I would like to ask. Thank you for the information.

The CHAIRMAN. Mr. Gonzalez?

Mr. GONZALEZ. Mr. Chairman, I would like to address the same questions I asked the Treasury officials yesterday to any or all of these gentlemen here this morning, and that is how do you feel about the revival of the transaction tax and the end-use certificate?

Now, the transaction tax we repealed in 1963. Although I did not know as much then as I do now, and I do not claim to know too much now, I did have doubts then. And it seems to me that the congressional intention being what it was when the transaction tax

was instituted and having served its purpose well during that period when it was important, it would seem now it would be more in order during this transition that will occur when and if we go into the new coinage.

Do you favor the restoration or revival of these two legislative measures as a concomitant matter of policy to be adopted by the Congress if this new coinage law is so passed?

Mr. WEMPLE. Mr. Gonzalez, my name is Wemple, and I am treasurer of Handy & Harman—maybe I can take a crack at that question.

First, the transaction tax. This tax originally was conceived 30 years ago when our entire tax structure was much different than it is today and was designed to tax and penalize speculation in silver on a rather severe basis. However, it never brought in any revenue of any large amount, and my recollection is that it may have initially, but it certainly did not over the great life of the tax.

It largely proved to be a restrictive affair which prevented the silver markets in the United States from developing to the extent that they might otherwise have developed.

We would be opposed to any revival of the transaction tax—and perhaps I should emphasize that the whole question of the need for it in our opinion would not arise if silver were completely eliminated from the U.S. coinage, because the U.S. Government would thereby soon not have any need for such control.

Now, as for the end-use certificate, I would say on that, speaking from the point of view of Handy & Harman, that if in the judgment of the Treasury Department an end-use certificate type of approach to control the use of existing silver supplies were considered necessary, we certainly would abide by them.

Mr. GONZALEZ. I am very interested in hearing that, because in your booklet you point out very emphatically and dramatically that since lend-lease the United States has turned out to be an exporter of silver.

Mr. WEMPLE. That is right, yes—last year they were a large exporter of silver.

Mr. GONZALEZ. I believe that—I have another question which might be pertinent in your case.

Do you have any knowledge of any kind of industrial speculation through inventory accumulation?

Mr. WEMPLE. We estimated at the end of 1964 that somewhere in the order of 70 million ounces on a worldwide basis were outstanding, either in the form of speculative holdings or in excess inventories accumulated as a hedge against a future shortage of supply, or a future sharp price increase.

I would guess at this point that little if any of these holdings have been liquidated up to now. My guess at this point would be that that substantially represents the amount at this time.

Mr. GONZALEZ. So perhaps some revival of the transaction tax—maybe not as severe as the one we repealed—but some modified form would be very much in point of order to be discussed by the Congress.

Now, after all, the thing that I am really worried about is the transition period, which I think that if we do not take measures in anticipation of speculation, of runs through excessive redemption of



the outstanding silver certificates, and related problems that could arise, that then this can very well turn out to end in chaos instead of being a help.

We won't solve the silver problem; we won't solve the coinage problem.

I think this is the only real worry that I personally feel as a member of this committee.

Therefore, these two measures, which I thought had proved to be pretty effective, at least during the period of time that they served their main function, as anticipated by Congress when it adopted them—that perhaps now would be the time to consider this seriously.

If there is industrial accumulation here with inventories that could create a problem, then we should seriously consider restoring the end-use certificate, because at least it would be a measure of controlling the domestic problem.

I don't know what we can do about the international speculation. But I think there is quite a bit we can do about the domestic speculation.

Mr. WEMPLE. I think on that point, the reintroduction of the end-use certificate, which as I said before we certainly would abide by—we have to recognize that the silver markets of the world have interplay with each other, and it is very difficult to isolate one from another. If we had an end-use certificate system, such as we had under the 1946 act, then it would end up the domestic industry which was eligible would use Treasury stocks, much as they did in 1960 and 1961, and foreign industry, which was not eligible, or foreign buyers who are not eligible would simply divert the other supplies which normally would be coming into this market. It is what we saw happen, Mr. Gonzalez, back in 1960 and 1961—that the flow of silver, the traditional flow of silver to this market was diverted to foreign markets. And I think we would see much the same thing happen again.

Mr. GONZALEZ. Thank you. I have been advised that my time has expired.

The CHAIRMAN. Mr. Stanton?

Mr. STANTON. I have no questions, Mr. Chairman.

The CHAIRMAN. Mr. Weltner?

Mr. WELTNER. No questions.

The CHAIRMAN. Mr. Hanna?

Mr. HANNA. Mr. Chairman, there is just one point I want to make—an observation first.

I do not conceive of the impact of silver in the coins being the same in our society as it was in the Roman Empire. For one thing, they had no concept of equity or use that was developed in this country. We have a whole generation of people who probably never have owned an automobile, but they don't care because they are using one all their life.

I just want to get at the one point, and that is what effect on the price or the support price would the use of silver in the half dollar have, if any?

Mr. Welfling, perhaps you should answer this. You have indicated there is 123 million ounces used in the United States a year for industrial purposes, that 203 million ounces have been used for coinage. Now we are going to knock off the 203 million ounces usage if we do

not put any silver in any coins. Now, what is that going to do to the price of silver, or the support of the price of silver?

Mr. WELFLING. I think the first question is how much silver would be used in the 50-cent piece.

Mr. HANNA. That is not my question. My question is, What is going to happen to the price of silver? That is my question.

Mr. WELFLING. In the near future?

Mr. HANNA. Yes. Assume that we are not going to use any silver in any coinage whatsoever next year. Now, what is going to be the price of silver?

Mr. WELFLING. The pressure on the price is upward, and the only thing that holds it down is the Treasury stop, which is available through redemption of silver certificates. So as long as that stock lasts, the price cannot rise above \$1.29.

Mr. HANNA. Is your answer that it is not going to have any effect on the price of silver—because I don't understand——

Mr. WELFLING. Yes.

Mr. HANNA. Is the lack of the use of silver in coinage would to affect the price of silver?

Mr. WELFLING. No; not for the foreseeable future.

Mr. HANNA. Now I will ask the same question of Mr. Strauss.

Mr. STRAUSS. If no silver at all is used in coinage, I would agree with Dr. Welfling that the immediate effect would be that the price would remain at \$1.29. I think the longrun effect is that it might remain at \$1.29 somewhat longer than it would if some silver were being used in coinage.

From the standpoint of the effect on price in a commodity that is free of any restraint, and at the moment the only restraint on silver, as Dr. Welfling properly pointed out, was the redemption of the silver certificates—once that is gone, it is total demand versus total supply—whatever the nature of the demand, whatever the nature of the supply.

So if you are restricting the total demand by completely eliminating coinage, of course it does have a dampening effect. But that is not to say it will push the price of silver down at this time because, as has been brought out in the statistics, even without any coinage use at the present time there is a deficit in the world supply of silver.

I would like to say that we are talking now really in longrun price movements.

The immediate effect of the President's recommendation and the knowledge that this committee was debating this bill was to unsettle the speculators. And I do not quite agree with what Mr. Wemple said in response to Congressman Gonzalez' question. The fact is that some of the speculative stocks that were accumulated last year are being drawn on now, not in the United States, but outside the United States. The price of silver in London, which had been at a premium over our price to the extent of the cost of freight—in other words, the British price was controlled by our \$1.29 price, plus what it costs to get silver to England. On Friday the price in England dropped to our price here minus the cost of getting silver to the United States. In other words, as the British looked at it—well, they could sell it at \$1.29 in the United States, but it costs them a cent and a half to get it to the United States. So the British price dropped to \$1.278.

The reason for that is that the people who had bought silver in London primarily as a hedge against devaluation of sterling, inci-



dentally, rather than as a speculation on silver per se, figures with the high bank rate there—they have to pay 6 or 7 percent on their money—they figured that the measures before this committee were going to insure that the price of silver in the near future was not going to rise—therefore why continue to carry silver and pay 6 percent interest per year. They are dumping their stocks. That is what is temporarily depressing the market.

But I think this is going to be a sort of a 9-day wonder. I do not think the price weakness will persist over there. I think the committee should be aware of the fact that it has occurred.

Mr. HANNA. Thank you.

Thank you, Mr. Chairman.

The CHAIRMAN. Mr. Mize?

Mr. MIZE. Thank you, Mr. Chairman.

Mr. Strauss and Mr. Hardy, we import both copper and nickel, and now we are going to start using copper and nickel in our coins. Do you anticipate any upward pressure on the price of nickel and copper?

Mr. STRAUSS. Mr. Mize, I am going to take exception to your statement. We do import most of our nickel. But our domestic copper mine production is about 1.2 million tons a year as against a total domestic requirement of about 1.5 million tons. So we do not import most of our copper. Most of our copper is mined in this country.

No, I do not believe that converting to the use of copper and nickel for coinage is going to put any pressure on the price of either of those commodities, for the reason that the mint has made it clear and the stockpile authorities have made it clear that the mint's requirements will be met for the time being, at any rate, by drawing down surplus copper and nickel already owned by the Government. So I do not believe this will affect the market price of either metal.

Mr. MIZE. Thank you.

Thank you, Mr. Chairman.

The CHAIRMAN. Mr. Grabowski?

Mr. GRABOWSKI. Admiral Ramsey, on page 7 of your statement you state that you feel that a ceiling should be spelled out by the Secretary of the Treasury in item 6 of our bill stating that not only should the Treasury be authorized but directed to sell silver at a fixed price of \$1.29. I assume this is important to the silver users. Why is that so?

Admiral RAMSEY. Yes, sir, we feel that it would be important. It is unclear at the moment—just exactly what is intended by these buying and selling provisions. The selling provision in the present law protects the coinage. The Treasury has to sell silver to keep the market price at \$1.29 because of coinage. The selling provision was not for the benefit of the silver-using industry.

We have to bear in mind that the \$1.29 price for silver today is a result of the redemption of silver certificates, which is another matter entirely.

Now, in case the Treasury has silver and is not redeeming silver certificates, for whatever reason, in that situation the Treasury would have to sell silver to keep the price at \$1.29 as long as it has to protect the coinage. Consequently, this provision, which has been inserted in this bill, to provide a floor of \$1.25 we feel should be compensated for by a ceiling spelled out just as this is spelled out for the floor. And that is my point.

But I think it is very important to remember that the Treasury does not set the market price in the terms of "fixing it" as has been so commonly stated. The price is determined by the redemption rate, and not by any deliberate action on the part of the Treasury. And the redemption is done through the obligation of the U.S. Government to redeem silver certificates in silver.

Mr. GRABOWSKI. Thank you.

The CHAIRMAN. Mr. White?

Mr. WHITE. Thank you, Mr. Chairman.

First of all I would like to ask Dr. Welfling a question.

In his statement he very definitely indicated that there is no need for intrinsic value in subsidiary coinage.

Do you believe there is a need for 25-percent gold backing of our present Federal Reserve notes?

Mr. WELFLING. I think that is only one way of——

Mr. WHITE. I asked the question—do you believe there is a need for the backing of 25 percent in gold behind our Federal Reserve notes?

Mr. WELFLING. I take it you would prefer a yes or no answer.

Mr. WHITE. Yes, sir; I would.

Mr. WELFLING. No.

Mr. WHITE. You do not feel there is.

Mr. WELFLING. No, sir.

Mr. WHITE. Mr. Martin, when he testified before our committee, felt this was necessary. The President of the United States has indicated it was necessary. You disagree with both Mr. Martin and the President of the United States.

Mr. WELFLING. If you want a yes or no answer that I disagree, yes.

Mr. WHITE. I will ask you another question, Doctor. That question is with respect to the circulation of the new coinage along with the proposed coinage.

Do you believe that the present 90-percent silver coins can stay in circulation with the cupronickel bonded layered coin?

Mr. WELFLING. Did you say the present 50-cent piece?

Mr. WHITE. The present 90 percent silver coinage.

Mr. WELFLING. I doubt it—but not because they are different; solely because the present 50-cent piece, it is so close to its redemption value.

Mr. WHITE. That is the difference between \$1.38 and \$1.29.

Mr. WELFLING. That is right.

Mr. WHITE. About 9 cents difference in monetary value.

Mr. WELFLING. Right.

Mr. WHITE. Isn't it a fact the intrinsic value has something to do with it? You are basing your opinion on intrinsic value; are you not?

Mr. WELFLING. That is precisely my objection to coins with intrinsic value.

Mr. WHITE. I ask the question again. Will the two coins stay in circulation side by side?

Mr. WELFLING. That depends upon the extent of the market price.

Mr. WHITE. You heard testimony here today, Doctor, that we are going to continue to maintain the price of silver at \$1.29 by the sale of silver stocks as long as we have silver available from our stocks at West Point.

Mr. WELFLING. Right.



Mr. WHITE. Therefore, the price is going to continue at \$1.29 as long as the Treasury will redeem silver certificates. Now, under that condition will the two coins stay in circulation side by side?

Mr. WELFLING. Not so long as that volume of silver that is in the 50-cent piece threatens to go above that market price in the near future.

Mr. WHITE. Does it not threaten to go above it at the time that we no longer have the stocks in silver at West Point.

Mr. WELFLING. Yes. The next block will be \$1.38.

Mr. WHITE. Then what would you anticipate to be the fate of our present 90-percent silver coinage?

Mr. WELFLING. It is a gamble——

Mr. WHITE. I am asking you to prognosticate a little.

Mr. WELFLING. That was about what I was to do, sir. I think it is a gamble whether the Treasury can hold that price. I think the odds are in favor that it will be able to. But I also think it should have every break.

Mr. WHITE. I agree with you that we are going to have to have coinage, and this is my primary objective; to continue a coinage that will be acceptable to the American public and do the business it is supposed to do.

In the event that the price of silver exceeds the monetary value that we now have in our subsidiary coinage, then you would agree that that coinage would very definitely be in jeopardy, as has been stated here several times.

Mr. WELFLING. Yes.

Mr. WHITE. All right. Then you also agree, that at the end of the time period when we no longer have the silver for sale, that that coinage will probably disappear, the 90-percent coinage, either by withdrawing by banks in the Federal Reserve System or people melting it down and putting it into some other form.

Mr. WELFLING. If the price exceeds the \$1.38 that would happen.

Mr. WHITE. Do you think at the time we get to the ultimate disposal of our stocks the price will exceed \$1.38?

Mr. WELFLING. That, of course, is prognosticating, as you said. If I had a bet, I would bet on the Treasury to win this. But it is not a sure bet.

Mr. WHITE. I don't quite understand what you mean by win.

Mr. WELFLING. I think the Treasury will be able to maintain the market price of silver until it has an adequate supply of the new coinage.

Mr. WHITE. I wonder about the available stock of 2 billion ounces that now exist in our subsidiary coinage—if we longer have stocks of silver, this coinage will disappear, will it not?

Mr. WELFLING. Yes, I understand your question. I did not say it would disappear. I said it would if the price reached \$1.38. And I think——

Mr. WHITE. I think we had better get back to a simple answer, yes or no.

Do you believe the price will reach \$1.38 after the Treasury stocks are depleted?

Mr. WELFLING. After they are depleted, yes, if they are depleted.

Mr. WHITE. At their present rate of consumption they are bound to be depleted, are they not, sir?

Mr. WELFLING. That is why I say it is a gamble. At the present rate they should last 2 years. But then you are betting on the present rate.

Mr. WHITE. How long has Great Britain been attempting to recall their subsidiary silver coinage?

Mr. WELFLING. I didn't know they were attempting to recall it.

Mr. WHITE. They were attempting for some period of time.

Mr. WELFLING. They went to another coin in 1946.

Mr. WHITE. Even before that they reduced the silver content.

Mr. WELFLING. Yes.

Mr. WHITE. For 40 years. And they have only been able to get 80 percent of it in that 40 years. So we are talking about a recovery of silver—it would be very difficult in our present subsidiary coinage. Again we are talking about the possibility of protecting our subsidiary coinage.

Well, I have some other questions I would like to ask you but I have been informed that my time has expired.

I thank the chairman very much.

The CHAIRMAN. Mr. Widnall?

Mr. WIDNALL. Thank you, Mr. Chairman.

Dr. Welfling, on page 5 of your statement you say:

Since 1934 the price has risen 80 percent, but annual production is still the same because it is largely tied to output of copper, lead, and zinc.

How much of the silver that we have today, that we are using today, is actually tied to production of copper, lead, and zinc—what percentage?

Mr. WELFLING. I am sure Mr. Strauss can give you a better answer. My recollection is that it is either 20 or 30 percent.

Mr. STRAUSS. About two-thirds of the production at the present time is tied to the production of base metals. About one-third is from mines that are valuable chiefly for their silver.

Mr. WIDNALL. How much of the increase in production of silver is attributed to copper, lead, and zinc, and how much to actual silver mining?

Mr. STRAUSS. Well, in the United States production has not increased particularly. This has been due primarily to the fact that the copper, lead, and zinc industry, as it has expanded, is treating more and more ores that do not carry any silver at all.

As far as the straight silver mines are concerned, as I said before they have not had economic incentives, because while their price is up 80 percent, the prices of commodities and the inflationary effect on the cost of doing business has been considerably more than 80 percent. So actually the economic position of the silver-mining industry today is not as good as it was in 1935 when all this started.

Mr. WIDNALL. What known sources of silver are not being worked today because of price, that could be worked—any material number?

Mr. HARDY. Undoubtedly there is much silver that is not being brought from the ground today because of economic conditions. I would like to call your attention to the fact that 100 years ago the price of silver was \$1.29 and a deposit that had 12 or 15 ounces of silver to the ton in those days was a relative bonanza, because the cost of mining was only about \$4 or \$5 a ton.



Today when you have costs of mining five and six times that and still a price of \$1.29 you can see that a deposit of 12 to 15 ounces per ton is not going to be operated.

There are many of those on the North American Continent, which is the primary home of silver, and the general locus lies between the summit of the Rocky Mountains and the summit of the coast range, from the Yukon territory down through British Columbia, the United States, into Mexico, through Central America, and on into South America, where of course the Andes is the governing feature.

Mr. WIDNALL. If the price of silver operated freely do you think it would be—it could be materially—the production could be materially increased without a Government subsidy?

Mr. HARDY. If the thing were exactly on a free market, where it was only the forces of consumption that were in the market, as to what would set the price of it, in accordance with what was produced, I am sure that the silver would come from the ground.

To say there is no more silver to be found and produced is completely wrong. There is plenty of it. As in the cases I quoted, uranium and copper—one might even look back at tungsten during the Korean war. It will come forth in answer to a call of price.

Mr. WIDNALL. Well, the point I am getting at is if you had a free market in silver and the price was absolutely free, would that production come without the request for Government incentives to produce?

Mr. HARDY. Oh, certainly; very much so.

Mr. STRAUSS. May I add something to that?

Congressman Widnall, I am not sure that you are aware of the fact that our committee has estimated a substantial increase in production that is in the making right now and that does not call for any kind of Government subsidy or assistance. We are not looking for subsidy.

Mr. WIDNALL. That is all; thank you.

The CHAIRMAN. Yes. Now we have all asked questions, I believe, and it is up to the wishes of the committee as to further proceedings. The only time we could have additional hearings would be Friday or Monday. Mr. Todd?

Mr. TODD. No questions.

The CHAIRMAN. Mr. Gettys?

Mr. GETTYS. Mr. Chairman, if the remaining members of the committee have no questions, I will forgo my questions.

The CHAIRMAN. Let us consider then whether or not we should pass on this bill and the amendments between now and 12 o'clock or have another session on Friday.

Mr. Multer called to my attention a very important point.

Any member desiring to ask questions may do so in writing and we will ask you gentlemen, if it is directed to any one of you, to supply the answer when you examine your transcript of the testimony.

Will that be satisfactory, gentlemen?

That will be fine.

And the record will be printed and available before the bill comes up on the floor of the House.

Mr. BROCK. Mr. Chairman, I understand there is an entirely new draft of the bill to be submitted in executive session. In addition there are going to be amendments offered. I intend to offer at least one and probably two. I am quite sure that Mr. White will have some to offer.

It seems to me that we are taking a pretty heavy burden to pass on legislation of this importance in this short a period of time.

The CHAIRMAN. If we don't get through by 12, we will just go over.

Mr. BROCK. It is perfectly all right with me. I don't think we need to rush with something like this. We ought to take time if necessary.

Mr. WHITE. Mr. Chairman——

The CHAIRMAN. Mr. Annunzio?

Mr. ANNUNZIO. Mr. Chairman, I ask permission that these statements from the International Jewelry Workers' Union be included and made part of the record.

The CHAIRMAN. Without objection, so ordered.

(The material referred to follows:)

CHICAGO, ILL., May 28, 1965.

Hon. FRANK ANNUNZIO,  
House of Representatives,  
House Office Building, Washington, D.C.

DEAR CONGRESSMAN ANNUNZIO: Respectfully request you support position of our International Jewelry Workers' Union, AFL-CIO, regarding the removal of silver from the minting of subsidiary coinage and redemption or retirement of silver certificates at conversion rate of \$1.29 per ounce. This is of vital concern to many of our members employed in Chicago if the price of what is regarded as a luxury item is driven too high. Loss of sales must result—followed by loss of employment to our members.

Your sympathetic interest in our problem will be deeply appreciated.

WILLIAM F. LENNON,  
President, Local 4.

INTERNATIONAL JEWELRY WORKERS' UNION  
New York, N.Y.

#### STATEMENT

The International Jewelry Workers' Union, AFL-CIO, which has thousands of members throughout the United States, urges that Congress take immediate measures to halt the use of silver in U.S. subsidiary coinage (dimes, quarters, and half dollars) as there is not enough silver being produced to satisfy either the needs for coinage, or the demands of industry. It is essential that supplies of this precious metal be conserved for use in industry where it has no substitute.

The U.S. Mint is expected to use 312 million ounces of silver this year to mint dimes, quarters, and half dollars. This is 40 percent greater than the entire free world production estimated for 1965, and more than 2½ times the amount needed by American industry. The U.S. Treasury's stocks are being depleted at an alarming rate to meet this deficit in supply.

Unless action is initiated immediately, to stop this senseless drain on America's silver resources, the U.S. Treasury's supplies of silver will vanish in less than 3 years. Every day, the situation is further aggravated. The International Jewelry Workers' Union is vitally concerned with this matter, for the jewelry and silverware industry is the third largest consumer of silver in the country and, if Treasury supplies of silver are permitted to disappear, the jobs of many hundreds—perhaps even thousands—of our members will be in serious jeopardy.

The price of silver in our industry is exceedingly important, since it accounts for as much as 75 percent of manufacturing costs in some of our major product categories. We, therefore, strongly oppose any action that might result in an increase in the price of silver. The retention of any amount of silver in coinage, or the failure of the U.S. Government to continue its present legal obligation to redeem silver certificates, would result in increased prices.

Since 1952, we have seen the price of silver bullion increase by 52 percent. Unit sales of silverware have declined in almost direct proportion, with corresponding loss of jobs.

Serious unemployment would result from any additional increase in the price of silver. There would be hardships caused to our members and their families, and the blow would be especially heavy in those communities in which the jewelry and silverware industries represent a major economic factor.



Because of the imperative nature of the situation, we urge that:

(1) Legislation be enacted immediately, providing for the elimination of silver in the manufacture of subsidiary coins; and

(2) The U.S. Treasury continue to make its silver available to domestic industry, through redemption or retirement of silver certificates at the current conversion rate of \$1.29 per ounce.

HARRY SPODICK,

*General president and general secretary-treasurer.*

The CHAIRMAN. Mr. White?

Mr. WHITE. Mr. Chairman, I believe you are aware that the Subcommittee on Mines and Mining of the Interior Committee, is holding some hearings with respect to silver production and consumption. I hope these hearings—which are to be concluded today—will be made available to the members before we take action on this bill.

The CHAIRMAN. They will be made available. It is customary and traditional.

Mr. WHITE. I would like to make the request that they be made available to us before we take final action.

The CHAIRMAN. It is not traditional to have the printed hearings before the committee votes. That has never been known to my knowledge. But now it is understood that we will have the hearings printed and available to the Members of the House before the bill comes to the floor of the House.

Mr. WHITE. Mr. Chairman, I would again like to point out that the Treasury Department has taken over 2 years to consider this legislation. Their report is 4 months late. It would seem to me that to try and push this through in 50 minutes would be a little inappropriate at this time.

The CHAIRMAN. Well, suppose we go into executive session, if it is satisfactory with the members, and then we will decide what we shall do.

Mr. BROCK. Before we do, Mr. Chairman, I would like to ask another question.

The CHAIRMAN. You mean of the witnesses?

Mr. BROCK. Yes, sir.

The CHAIRMAN. Certainly. You may proceed, sir.

Mr. BROCK. Gentlemen, some of you have expressed rather strong concern over the availability of silver in the future.

What would be your reaction to the possibility of requiring in this bill that all new coins, the reduced value coins be printed with the date of 1965, and all silver content coins have a date of 1964 so that if sometime in the future we are faced with a national emergency and we needed to get these coins back into the hands of the Treasury, to get the silver content, we would have a method of finding out—we would have a method of encouraging people to turn the coins in.

Is this a feasible approach?

Admiral RAMSEY. I think that is a tough question to answer. But I would say this: It is estimated variously that there are from 1.2 to 1.4 billion ounces of silver in outstanding subsidiary coins at the present time, which we feel in a national emergency could be called in and used for whatever purposes it might be needed.

Now, that is the only way I can answer your question.

I do not quite follow what you are trying to do otherwise.

Mr. BROCK. I am trying to differentiate just on the matter of dates so it would be easily identifiable.

Admiral RAMSEY. I don't think it is going to make much difference whether it is 1964 or 1965. If we need silver coins and we need silver and we are going to call them in, if the Government is going to nationalize coins, I don't think it would make much difference what the date is.

Mr. BROCK. Except some people are not as aware of these coins as you and I might be and might not know the difference.

Admiral RAMSEY. I see what you mean. In other words you are talking about the 50-cent reduced content coin.

Mr. BROCK. That is true. I am also talking about the cupronickel coin. We have been told they are so good you can hardly tell the difference.

Admiral RAMSEY. I don't think I can get into that one, Mr. Brock. The best thing I could say is I think we could differentiate the coins if you had to call them in. I think the Government would have no trouble in getting in the silver coins with the high content silver. It might be an interesting situation, but I think they can do it.

The CHAIRMAN. Shall we have an executive session now?

Without objection, so ordered.

(The following statements and correspondence were submitted for inclusion in the record:)

STATEMENT OF HON. CRAIG HOSMER, A REPRESENTATIVE IN CONGRESS FROM  
THE STATE OF CALIFORNIA

Mr. Chairman, my name is Craig Hosmer, Representative from the 32d District' California. I appear before you to point out what I believe to be three serious defects in H.R. 8746.

Despite statements in the President's message to Congress on June 3, 1965, relative to the coinage proposal and the statements to your committee by Henry H. Fowler, Secretary of the Treasury, it is my considered opinion that Gresham's law has not been repealed. I believe it is inevitable that the new coins of nominal intrinsic value cannot for long circulate alongside existing silver coins without driving the latter into hoarding and out of circulation. The record of many governments who have attempted to outlaw melting down coins, exporting them, and imposing other restrictions regarding them has consistently been characterized by failure.

To obviate the operation of Gresham's law, I suggest that the legislation include discretionary authority for the Secretary of the Treasury to substitute for a fraction of the metals that the bill authorizes for use in the new coins another metal of specified isotopic content. This will enable the Secretary of the Treasury to establish a metallic value for the substitute metal equivalent to that of the silver in existing coins and thereby put the old coins and the new coins on parity. In order to accomplish this, of course, the Secretary of the Treasury must have authority to purchase quantities of the substitute metal when it is offered at the mint.

It is apparent that the physical process of minting new coins will not keep up with the demand despite the pious hopes expressed by some witnesses to your committee. This alone or taken in conjunction with the operation of Gresham's law threatens to create a massive coin shortage in this country, disturbing the public convenience and necessity in its fractional dollar transactions. Therefore, the bill should contain discretionary authority for the Secretary of the Treasury to print and issue fractional paper currency which can to an extent alleviate the prophesied inconvenience.

It is my own estimate that the cost of producing the new coins will not exceed 20-percent of their face value on the average. This is a very generous estimate and the likely fact is that the cost of production will be considerably less. Taking the 20 percent figure, however, for the purposes of illustration, it is pointed out that at the present time there are approximately 12,394 million coins in present circulation having a face value of \$2,230,100,000. At the 20-percent seigniorage figure, replacement of this coinage in circulation should accrue a profit of about \$1,780,080,000 to the Treasury. Additionally, at the present rate of annual replacement of coins and additions to the supply, over \$350 million a year of face value must be



coined and issued. The Treasury's 80-percent profit on these should amount to some \$280 million annually. Furthermore, should the Treasury be able to recapture all existing subsidiary coinage, its silver content, if sold, could represent another \$2 billion, or so, profit to the Treasury.

It appears to me that these profits should not be squandered by sublimation into a mass of Treasury statistics. Rather they should be applied against the national debt monthly as they accrue. It is my strong recommendation that provision to such effect be included in H.R. 8746.

I hope that the committee takes favorable action upon these recommendations. If it does not do so, I intend to offer amendments to the bill implementing them when it reaches the House floor.

STATEMENT BY THOMAS B. HUNGERFORD, NATIONAL AUTOMATIC MERCHANDISING ASSOCIATION, CHICAGO, ILL., IN SUPPORT OF S. 2080 AND H.R. 8746

Mr. Chairman, distinguished members of the committee, I am Thomas B. Hungerford, executive director of the National Automatic Merchandising Association, with headquarters in Chicago, Ill.

We are the national trade association of the merchandise and service vending industry. Our more than 1,400 member firms include all 3 segments of our business: Companies which own and operate vending machines, firms which manufacture the machines, and companies which supply vendible products and services to the operators of machines.

The purpose of my testimony is to give wholehearted support to the President's message proposing the new coins and, specifically, to Senate bill 2080 which has been introduced also as House bill 8746.

In supporting this legislation, I speak in behalf of our own members, as well as several allied associations which represent other coin-operated types of businesses. These include coin-op laundries, music machines, and soft drink bottles.

The vending industry considers the President's proposal for new coinage a most imaginative and practical solution to the problem of dwindling silver reserves. All Americans have a stake in the various aspects of the silver shortage. Our industry has, from the beginning, gone on record for a solution which will put the public interest above other considerations. For the sake of brevity, I will refer only to the specific involvement of coin-operated equipment services.

Ever since World War II, vending services have become increasingly important to the American consumer. The American public now puts 30 billion coins into merchandising vending machines alone, every year. Our machines will sell more than \$3.5 billion worth of goods in 1965. By 1970 this important part of our retailing economy is expected to rise above \$5.5 billion in sales per year.

What this means to the average citizen, however, can be better illustrated in another way: More than 1,500,000 Americans now obtain at least 1 meal every day from vending machines where they work. Our customers include the employees in thousands of factories, hospitals, and offices. Colleges and other institutions depend on vending service for meals, and especially for snacks and coffee breaks. For example, in 32 different plants of the Radio Corp of America more than 60,000 employees are served every day through vending machines. I can give you an example still closer to home. Even employees at the White House, here in Washington, use a vending installation for snack and refreshment service.

Vending is important not only to millions of customers but also to hundreds of product manufacturers. For example, every fourth nickel and dime candy bar now comes from a vending machine. So do 20 percent of all away-from-home soft drink sales and more than 3 billion cups of coffee per year.

Since I began speaking to you—about 3 minutes ago—the American public has put 174,000 coins into our machines. On an annual basis this amounts to over 30 billion coins.

It can easily be seen that unless these coins work properly, irritation and widespread complaints would result.

Coins are the lifeblood of our business. And the heart of each vending machine is the coin mechanism which decides whether the coin is genuine and whether the machine should therefore dispense the product or service.

It might be interesting to note that until the first of these sophisticated mechanisms was invented in the 1930's, the vending industry was literally "slugged" out of business. Only with the invention of the so-called "eddy current" slug rejector did we gain the ability to tell good coins from bad coins.

These coin mechanisms first check the coin for size and thickness. But the key test checks the metallic content of the coin. It so happens that our testing mechanisms were designed for the present silver coins.

If I may, I would like to demonstrate just how this works.

Only coins with similar density and electrical resistivity to our present silver coins will pass this test. All other coins, and counterfeits, are rejected.

If the new coins to be adopted by the Congress have a different metallic reaction, they will be rejected just like "slugs." Public confusion, and even indignation, would surely result. Conceivably, consumers would, so to speak, blame our Government for minting "bad" coins.

More than half of the 12 million coin-operated units of all types use the metallic-content test which I have just described. It would take at least 3 years to design and produce new mechanisms in order to equip all of these units, if "noncompatible" coins are adopted. And it would cost our industry more than \$100 million to change over. This does not count hundreds of millions of dollars in loss of sales during the changeover.

Obviously this would be a serious problem to our industry, as well as to the public.

The new dimes, quarters, and half dollars proposed by the President in the legislation now before you will work reliably in our existing equipment without any change. The important thing is that the public will be able to use the proposed coins in our machines side by side with the present silver coins without any trouble.

The coins proposed by the President will be an ideal solution for our millions of customers, and also for the more than 6,000 companies which own and operate merchandise vending machines. This is also true for the other coin-operated businesses of which I spoke.

It should be understood that a satisfactory half dollar is crucial to the music machine industry and to the coin-operated laundry businesses especially. But this coin also has increasing importance for merchandise vending, because cigarette prices are approaching the 50-cent mark and many new types of merchandise which we now sell will require the half-dollar coin in the future.

Our industry strongly backs the President's proposal for the new coins and urges the Congress to vote its approval.

We are grateful to the committee for this opportunity to offer testimony.

#### VENDING SERVICES FOR U.S. CONSUMER CONVENIENCE HINGE ON CONGRESSIONAL APPROVAL OF PRESIDENT'S COINAGE PROPOSAL

The future of luncheon facilities and refreshment breaks for millions of factory employees and college students is up for a vote by the U.S. Congress in the next few weeks, when it decides what to put in place of the present silver content of our dimes, quarters, and half dollars.

Serious disruption of vital services and considerable economic dislocation will result unless the Congress provides for new coins which will work satisfactorily in food and beverage machines which serve thousands of factories, offices, colleges, hospitals, service stations, and many other locations.

Included in the congressional decision will be the fate of 12,200 million cups of coffee, milk, and soft drinks and of 4,500 million candy bars. These are just a fraction of the numerous goods which poured forth last year as Americans plunked more than 30 billion coins into merchandise vending machines of all types.

With more than 83 million coins used in merchandise venders alone every 24 hours, a wrong decision could bring irritation and angry words from the millions of American consumers who buy everything from clean laundry to hamburgers, kleenex, postage stamps, telephone calls, ice, dance music, and photostats at the drop of a coin.

The metallic content of our coins directly affects the more than 6 million mechanisms which test whether a coin is accepted or rejected before they activate coin-operated machines.

Since the mechanisms check the metallic properties of the coin based on a magnetic field, only coins which react like present silver money get the green light. All other coins, and slugs, are rejected. According to vending industry technicians, the fate of \$3.5 billion in annual sales of vended products depends on whether Congress votes the right kind of substitute coins.

Coins with less silver and coins based on a modern clad process bonding two different metals into a three-layer sandwich would be the ideal solution, because they work like present coins, will be accepted interchangeably until present silver coins go out of circulation in a few years.



Clad metal is the modern process which is widely used in automobiles, refrigerators, and many other industrial and consumer goods. It is easy and economical to mint and, therefore, guarantees an ample coin supply for the growing U.S. economy.

Since these new coins could be minted with a smaller amount of silver, and even without any silver content at all, they provide the ideal answer to the growing shortage in the Government's silver reserve.

With more Americans relying on coin-operated services every year, coins which work in present equipment are crucial to the vending industry.

Growing at an average of almost 10 percent every year since the 1950's the American vending industry will sell more than \$3.5 billion in goods this year.

One out of four nickel and dime candy bars sold, one out of five soft drinks consumed away from home, and nearly 3 billion cups of coffee were bought by the American consumer from vending machines last year.

Coins are also the open sesame for 1,200,000 telephones, 228,000 laundry, dryer and dry-cleaning machines, 470,000 music machines (plus 1,410,000 separate wall boxes), 650,000 amusement machines and kiddie rides, 250,000 wall coin changers and 33,000 postage stamp machines, of which 8,000 are operated by the U.S. Government.

By far the greatest advance of vended services has come in factories, colleges, and hospitals. More than 1,500,000 American workers and students rely on vended food service for at least one meal each day.

Martin O'Shaughnessy, administrator of food services for Radio Corp. of America, Camden, N.J., says RCA depends heavily on vended services for its employees.

"In several of our major manufacturing plants vending services are the only medium to provide food to our employees. Even in all of our other plants, where conventional food service is used, vending represents about 50 percent of our employees' daily food purchases."

He adds that 32 RCA plants utilize vending machines, serving some 60,000 of the company's 80,000 employees.

Whether the Congress adopts coins which will work in present coin equipment is also of crucial importance to the more than 6,000 firms which own and service vending machines as a full-time business.

More than 4,000 of these companies are small independent businesses with six or fewer employees. Only a handful of large companies employ thousands of servicemen on a national basis.

To the smaller firms, especially, an adverse decision by the Congress would mean extinction, because even if they could finance the high expense of changing their coin mechanisms, they would not be able to survive the loss of sales until new coin mechanisms become available. (Production time has been estimated at 3 years, if a complete changeover should become necessary.)

Thus, while the plink of coins into vending machines goes on at the rate of more than 58,000 every minute, the industry holds its breath, hoping that 535 Senators and Congressmen will vote for happy consumers and against out of order signs.

FACTS AND FIGURES

ABOUT THE MERCHANDISE VENDING INDUSTRY

Value of goods sold through machines in 1964 (estimated)-----	\$3, 500, 000, 000
Number of machines on location-----	4, 500, 000
Vending machines with coin mechanisms using the "eddy cur- rent" principle-----	3, 300, 000
Number of coins inserted in vending machines:	
Hourly-----	3, 483, 183
Daily-----	83, 596, 383
Annually-----	30, 512, 680, 000
Number of Americans who obtain at least 1 meal daily from vending machines (estimated)-----	1, 500, 000
Vending employment:	
Number of vending operating companies (1964)-----	6, 200
Number employed directly-----	80, 000
Suppliers' employees furnishing products to the vending industry-----	300, 000
Total vending industry annual payroll-----	<sup>1</sup> \$600, 000, 000

ABOUT OTHER COIN-OPERATED BUSINESSES

Number of coin telephones in use-----	1, 200, 000
Number of wall-type coin changers (used in coin-op laundries, with phone booths, etc.)-----	250, 000
Number of music machines on location (1963)-----	470, 000
Gross sales through music machines (1963)-----	\$419, 000, 000
Number of coin-op laundry stores-----	35, 000
Includes:	
770,000 washing machines, 250,000 dryers (annual sales)---	\$500, 000, 000
60,000 drycleaning units, annual sales (in 8,000 of the 35,000 stores)-----	\$200, 000, 000

<sup>1</sup> Over.

NOTE.—All figures are for 1964 unless indicated otherwise.

Retail sales through merchandise vending machines in 1964 totaled \$3,494 million. At the present rate of growth, vending machine sales in 1970 will be \$5,250 million.

*Number of coin-operated machines using "eddy-current" coin mechanisms*

	1964	1970 <sup>1</sup>
Merchandise vending machines-----	3, 300, 000	4, 420, 000
Music machines including wall boxes-----	1, 880, 000	2, 200, 000
Amusement machines-----	600, 000	750, 000
Coin changers (wall type)-----	250, 000	340, 000
Coin-op laundry (washing) machines-----	115, 500	150, 000
Coin-op dryer machines-----	62, 500	80, 000
Coin-op drycleaning machines-----	50, 000	64, 000
Kiddie rides-----	50, 000	65, 000
Postage stamp machines (other than Government)-----	25, 000	43, 000
U.S. Post Office Department, stamp machines-----	<sup>2</sup> 8, 000	
Parking gates-----	2, 400	4, 800
Total-----	6, 343, 400	8, 116, 800

<sup>1</sup> At current rate of increase.

<sup>2</sup> 1965.

THE AMERICAN BANKERS ASSOCIATION,  
New York, N.Y., June 7, 1965.

HON. WRIGHT PATMAN,  
Chairman, Banking and Currency Committee,  
House of Representatives, Washington, D.C.

DEAR MR. CHAIRMAN: The American Bankers Association supports the changes in our coinage system as recommended to the Congress by President Johnson in his message of June 3, 1965, and urges enactment of H.R. 8746, a bill to provide



for the coinage of the United States, which is now under consideration by the House Banking and Currency Committee. I expressed the association's support in a statement released to the press on June 3, 1965, a copy of which is attached.

The shortage of coins in circulation has been acute at times during the past few years and has caused serious problems to banking institutions in meeting the business needs of their customers. During the April 1965 meeting of the executive council of the association the situation at that time was discussed by the Federal agency relations, Federal legislative, and economic policy committees of the association. Following this meeting the administrative committee of ABA further reviewed the matter and adopted a resolution on April 19, 1965, recommending the elimination of silver from U.S. subsidiary coins, etc. I am attaching a copy of this resolution, also.

We will be glad if you will include our views in the record of your hearings on H.R. 8746.

Very truly yours,

RENO ODLIN, *President.*

#### COINAGE SYSTEM CHANGES RECEIVE SUPPORT OF THE AMERICAN BANKERS ASSOCIATION

WASHINGTON, D.C., June 3.—Reno Odlin, president of the American Bankers Association, today expressed the ABA's support of changes in our coinage system as recommended to the Congress by President Johnson.

Mr. Odlin, who is chairman, the Puget Sound National Bank, Tacoma, Wash., also commended the Treasury Department for its detailed study which formed the basis for the President's proposals, and gave assurance that the ABA would do its utmost to assure a smooth transition to the new system.

The text of Mr. Odlin's statement follows:

"The American Bankers Association is in full accord with the recommendations made by President Johnson with respect to changes in our coinage system. The association's administrative committee reviewed this problem on April 19, 1965, and agreed that continued use of silver in subsidiary coins had reached critical proportions and recommended that some action be taken to change our subsidiary coinage while the Treasury still possesses substantial amounts of silver that can be supplied to the market through redemption of silver certificates.

"The ABA is very much aware of the impact which these coinage proposals may have on the American public. We subscribe to the President's belief that there should be no untoward concern about the change to composite coins, and we will also urge all of our 14,000 member banks to make clear to their depositors that the purchasing power of the coins has not been diminished in any way and that they should be assimilated into business and personal use as quickly as possible. By the same token, we will urge that any tendency toward hoarding of existing silver coins be discouraged.

"The ABA is convinced that the President's proposals will provide a long-range and fundamental solution to both the existing coin shortage and the demands for silver which makes it impractical to continue for the long-term future large-scale production of silver coins. Elimination of silver from dimes and quarters with the substitution of composite coins will provide an acceptable and convenient coinage that has been proven suitable for automatic coin machine operations.

"While the association would have preferred the complete elimination of silver from half dollars also, we can readily accept the administration's assurances that half dollars of 40 percent silver content will not produce a substantial drain on existing silver stocks. The previous decision not to mint additional silver dollars at this time is also supported by this association, although we are pleased to note that the authority to do so is being continued so as to make them available for use in the future if conditions so warrant.

"The additional recommendations for legislation made by the President should prevent or reduce hoarding of existing silver coins during the transitional period to the new system. Presidential authority to prohibit melting and exportation of subsidiary coins is absolutely necessary in this regard. Otherwise there undoubtedly would be substantial amounts of silver coins taken out of circulation and held in anticipation of a future rise in the market price of silver at which time the coins could be sold or melted for their silver content. Similarly, the authority for the Treasury to purchase domestically mined silver at not less than \$1.25 per ounce is necessary to protect silver producers from a sharp drop in the price of silver.

"The ABA wishes to commend the Treasury Department for its excellent and detailed study of a highly complex problem. During the past year we have been pleased to cooperate with the Department in eliminating coin shortages and we again offer our services in helping to assure a smooth transition to the new coin system."

#### SILVER CONTENT OF SUBSIDIARY COINS

Although the efforts of the Treasury Department and the American Bankers Association to eliminate the shortage of coin have met with some success, shortages still persist in many areas. Moreover, the rise in the market price of silver to its monetary value of \$1.29 per ounce has led to hoarding of coins and silver bullion. This, together with the increasing industrial use of silver, has resulted in a 40-percent reduction, from more than 1.5 billion ounces to about 1 billion ounces, in the Treasury's silver stock during the past 2 years.

The American Bankers Association, while recognizing the traditional role of silver in U.S. coinage, is convinced that a long-range and fundamental solution to the coin shortage must recognize the fact that the sharp and continuing rise in industrial demands for silver will increasingly limit its usefulness for subsidiary coinage. Accordingly, we urge the following steps:

1. We urge the Congress to enact legislation designed to eliminate at the earliest practicable date silver from U.S. subsidiary coins (dimes, quarters, and half dollars), recognizing, of course, that substitute materials would have to be suitable for automatic coin machine operations.

2. We urge the Treasury not to mint additional silver dollars at this time, but that the authority to do so be continued, so as to be available for use in the future if conditions so warrant.

3. Consideration should also be given to temporary discontinuation of the minting of 50-cent pieces, very few of which are moving into actual circulation. This would permit the Treasury to divert all possible facilities to the production of quarters, dimes, and nickels in order to build up stocks to prevent acute shortages if hoarding occurs during the transition to a new system.

4. In order to prevent or reduce hoarding demand for silver coins during the transition period to the new system, we urge administrative actions, or, if necessary, passage of legislation to prohibit melting or exportation of subsidiary silver coins.

5. In addition, we restate our recommendations of April 20, 1964, that the year of coinage on subsidiary coins not be changed each year, but that it remain the same for all coins of each new design; and that private commercial facilities be used as much as possible to augment the output of the mint until additional Government facilities are in operation.

Resolution approved by the Administrative Committee of the American Bankers Association, April 19, 1965.

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CHAMBER OF COMMERCE OF THE UNITED STATES,  
Washington, D.C., June 8, 1965.

Hon. WRIGHT PATMAN,  
Chairman, House Banking and Currency Committee,  
U.S. House of Representatives,  
Washington, D.C.

DEAR MR. CHAIRMAN: The Chamber of Commerce of the United States endorses those provisions of S. 2080 and H.R. 8746 which authorize reduction of the silver content of coinage and urges their prompt enactment.

It is well recognized that current industrial and monetary demands for silver have created a shortage of supply of national significance. For this reason we support reduction of the silver content of coinage to the extent necessary to resolve the current supply problem, while maintaining a metallic coinage system.

While reasonable men might differ as to the specifics of the proposed coin composition, there can be no dissent as to the urgent need for revision in the light of the present shortage of silver. The present proposal meets the exigencies of the current situation with the least disruptive effect upon our system of coinage and our economy.

Sincerely yours,

THERON J. RICE.



THE NEW ENGLAND COUNCIL,  
*Boston, Mass., June 8, 1965.*

HON. WRIGHT PATMAN,  
*Chairman, Banking and Currency Committee,  
 House of Representatives,  
 Washington, D.C.*

DEAR CONGRESSMAN PATMAN: On behalf of the New England Council, I would like to present our views on H.R. 8746, the proposed Coinage Act of 1965.

The New England Council is a private, nonprofit organization with offices in Boston, Mass. It is composed of 2,200 members from business, labor, education, and government, and is dedicated to the development of a sound and dynamic region through the full utilization of all of the region's human, natural, and material resources. With New England's economic development as a focus, the organization seeks to identify the region's broad public interest and promotes appropriate programs of action to implement its findings.

New England is basically a silver-using region. Its jewelry, silverware, photography, and electronic industries all depend on the availability of silver at reasonable prices. It is, therefore, vitally interested in any legislation which would change the use of silver in coinage.

There is wide agreement that a serious silver shortage is developing. Current projections have established that in coming years there may well not be sufficient silver to meet both the growing needs for silver in industry and the rapidly increasing need for more and more coins as population grows and business activity increases. The administration has carefully studied the problem and proposed specific legislation, H.R. 8746, to help solve it.

While we support the objectives of this measure, we have reservations as to its adequacy. We believe that serious consideration should be given to completely eliminating silver from subsidiary coinage. The compelling reasons for eliminating silver from use in the dime and quarter are equally valid for the half dollar and we urge complete removal of silver in all subsidiary coinage. Such a step would in no way change the value of subsidiary coinage as currency. It should be emphasized that there is no substitute for silver in industry, but there are perfectly adequate substitutes for silver in coinage. It is important to plan for one change only and not create the need for further action in the future.

Thank you for your consideration.

Respectfully yours,

GARDNER A. CAVERLY,  
*Executive Vice President.*

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BELL TELEPHONE LABORATORIES, INC.,  
*Murray Hill, N.J., June 8, 1965.*

HON. WRIGHT PATMAN,  
*Chairman, Committee on Banking and Currency,  
 House of Representatives, Washington, D.C.*

DEAR MR. CHAIRMAN: This letter presents the views of the Bell Telephone System in regard to H.R. 8746, a bill to authorize changes in the composition of the 10-, 25-, and 50-cent U.S. subsidiary coinage.

The Bell Telephone Laboratories, Inc., is the research and development arm of the Bell Telephone System, being a subsidiary of the American Telephone & Telegraph Co. and the Western Electric Co. Technical information developed by the laboratories is made available to the Bell Operating Cos. through the American Telephone & Telegraph Co.

Early in 1964, in my capacity as head, public telephone department of the Bell Telephone Laboratories, I was requested to study the functional properties of coins in their application in coin-operated mechanisms and to identify those properties which are essential for continued operation of the public telephones. This request by the engineering department of the American Telephone & Telegraph Co. resulted because of the use of 5-, 10-, and 25-cent coins in public and semipublic telephones of the Bell System operating companies.

To identify the essential properties of the subsidiary coinage used in public and semipublic telephones it was necessary to determine the operating characteristics relating to the coinage for the over 1,100,000 coin telephones presently installed. Obviously, any incompatibility in coinage would have an extremely serious effect on our ability to provide public telephone service. In this respect it is of interest to note that on the average approximately 10 million coin-operated

telephone calls are made each day from Bell System telephones and a proportionate number from coin telephones owned and operated by the independent (non-Bell) telephone companies. I understand that these independent coin telephones require the same properties for coinage as the present Bell System telephones. To permit future improvements in coin telephone service, it was necessary to investigate the operating characteristics of present coinage in new and proposed coin mechanisms which could be associated with the public telephones. The operating characteristics of the present coin telephones and of proposed coin mechanisms show that the size, weight, and electrical properties are crucial and that the latter two properties are intimately tied to the composition. Tests using sample coinlike disks in the coin equipment show that any significant departure from the dimensions, weight, or electrical properties of the present silver base coinage would produce malfunction of the equipment and rejection of the coinage. Theoretical studies which permit a broader understanding of these properties than is practicable with physical tests also support further this conclusion.

In the course of the study program at the Bell Telephone Laboratories we have identified clad metal combinations which do possess similar properties as present silver subsidiary coinage and which can serve as the basis for new compatible coinage. We have also tested many metal combinations which do not meet the requirements for compatible coinage. I am pleased to state that the 75 percent of copper and 25 percent of nickel clad on a core of pure copper authorized for the 10- and 25-cent coins in H.R. 8746 has been tested by the laboratories and meets all of the weight and electrical requirements for compatibility. Coins made from this metal to the dimensions of present 10- and 25-cent coins will permit continued service at public telephones. I can also state that the 50-cent silver alloy clad on a silver-copper alloy core also satisfies the technical requirements for compatibility.

I appreciate the opportunity of placing the views of the Bell Telephone System before the committee, and I will be available for further information at any time.

Respectfully,

W. PFERD,  
*Head, Public Telephone Department.*

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ALLEGHENY CIGARETTE SERVICE Co.,  
*Pittsburgh, Pa., April 21, 1965.*

Congressman WILLIAM S. MOORHEAD,  
*U.S. Post Office,  
Federal Building, Pittsburgh, Pa.*

DEAR CONGRESSMAN: Our company is engaged in the automatic merchandising business. As such, we are vitally interested in the forthcoming bill to be recommended by the Treasury Department, proposing a change in the silver content of our U.S. coin.

While we are not taking sides as to the continued use of silver or the elimination of silver, we are very much concerned with making sure that the coins that are adopted will not be inconsistent with the ability of our vending machines to accept good coins and reject counterfeits or slugs. Our national association, the National Automatic Merchandising Association, has spent many months in studying this problem. We believe they have covered in detail, all the facets this problem contains. They have made recommendations to the Treasury Department of three alternate plans, any one of which would enable us to continue operating our present equipment without costly changeover or a great deal of annoyance to the American consumers. A copy of these recommendations is being enclosed herewith for your study.

Our company and its subsidiaries employ approximately 40 people who would be directly affected by the adoption of a coin inconsistent with the ability of our equipment to accept them. Far more important, I believe, to you as a representative of the people of Pennsylvania, is the serious effect it would have on the purchasing public who use our equipment in the more than 2,000 locations we service. The enclosed recommendations of our industry's position points out that there are more than 83 million transactions made by vending machines such as ours every day.

You can well understand, therefore, that any coin which cannot be used by our present mechanisms, would cost our industry thousands of dollars in order to make our machines accept such coin. I am sure you can also appreciate the confusion and the irritation and annoyance that your constituents will be sub-



jected to at coffee breaks, at lunch time, and even while traveling if they attempt to use the vending machines to make purchases and find the new legal coins will not operate the machines from which they wish to obtain their meal or refreshments.

Your support in making sure that an acceptable coin is decided upon will be appreciated.

Sincerely yours,

HARRY ROSEN.

#### THE VENDING INDUSTRY'S POSITION ON COINAGE

The merchandise and service vending industry urges a solution to the shortage of silver for coinage which will cause the least confusion and inconvenience to the American public by assuring the continued operation of millions of existing coin mechanisms.

Such mechanisms are used in more than 3,300,000 vending machines, 250,000 coin changers, and 470,000 music machines (plus their 1,410,000 attachments) throughout the country. The operation of some 1,200,000 coin telephones is also affected.

Accordingly, the National Automatic Merchandising Association advocates one or another of the following alternates in place of the present 90-percent silver alloy currently used in dimes, quarters, and half dollars:

1. A reduction in the silver content of the present silver-copper alloy coin to any combination of silver and copper which will work satisfactorily in present coin mechanisms.

2. A clad (laminated) coin made from outer layers of silver-copper alloy on a copper alloy core.

3. A clad (laminated) coin made of cupronickel outer layers on a pure copper core.

The first two solutions require the retention of a reduced silver content. The third requires no silver.

The vending industry is neither for nor against the retention of silver in the coinage. It supports any solution which provides for coins that will function satisfactorily in existing coin equipment, thus assuring the American public of trouble-free operation with both present and new coins.

Any coin made from an alloy of high electrical resistivity and density, such as cupronickel alloy, will require the replacement of existing coin mechanisms. The adoption of a high-resistivity alloy would also cause severe counterfeiting and slug problems, even after all coin mechanisms are replaced.

The vending industry stands in firm opposition to such a solution.

Public inconvenience resulting from "noncompatible" coins would arouse widespread resentment. Such coins would cause the disruption of operations in thousands of plants, offices, and institutions where employees rely on vending machines around the clock for food and refreshment services.

With more than 83 million vending machine transactions every day (and comparable use of coin telephones and other coin-operated devices), it is imperative that both existing and new coins work satisfactorily in present coin-operated equipment.

The vending industry supports all practical measures which will insure an adequate coin supply for U.S. commerce and which will prevent the disappearance of coins from circulation.

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SMITHTOWN, N.Y., *April 30, 1965.*

Hon. O. G. PIKE,  
*House of Representatives, Washington, D.C.*

DEAR SIR: I am in the automatic merchandise vending machine business and I am vitally concerned with a bill proposing a change in the silver content of our U.S. coins.

Our national association, National Automatic Merchandising Association, reports that 30 million vending transactions take place hourly in this country. Pay telephones and parking meters were not considered in arriving at this figure. More than 4½ million vending machines are in use today, equipped with coin mechanisms to test the validity of the coins being used. A change in the metallic composition of the coin could render these testing units and vending machines useless.

Many of these machines are used throughout the country to vend food for personnel employed by the automotive, electrical, and steel industry. It is therefore, a serious problem if the present coin is changed to such an extent that it would not operate in our equipment. By change, I am not only referring to the size but more important, the metallic content which determines the acceptance of the coin in the machine used.

It is true that new mechanisms could be manufactured but the cost per machine and the sales lost if and when the mechanism was made available, would be more than I could afford.

I support any solution which provides for coins that will function satisfactorily in existing coin equipment.

Thank you very much for your consideration.

Yours very truly,

EDWARD N. ROSSELOT.

MACKE VENDING Co.,  
Washington, D.C., June 7, 1965.

Dr. PAUL NELSON,  
Clerk and Staff Director,  
Banking and Currency Committee,  
U.S. House of Representatives, Washington, D.C.

DEAR DR. NELSON: I would appreciate your inclusion of my enclosed statement in the record of the hearings before the House Banking and Currency Committee on H.R. 8746.

Yours very truly,

AARON GOLDMAN, *President.*

Enclosure.

#### STATEMENT OF AARON GOLDMAN, PRESIDENT, MACKE VENDING CO.

Mr. Chairman and members of the committee: I am Aaron Goldman, president of the Macke Vending Co, one of the largest vending companies in the Nation. I am submitting this statement to you on behalf of my company and the vending industry in wholehearted support of H.R. 8746, the President's proposed legislation for a new U.S. coinage.

We believe that any change in the coinage must be one which will cause the least confusion and inconvenience to the American public by assuring the continued operation of the millions of existing coin-operated vending machines. Therefore, any new coins must be compatible with existing coins in use in all existing coin mechanisms.

Most vending machines are equipped with a sophisticated coin testing device designed to handle a large volume and variety of coins, to give the customer change automatically and to reject foreign or damaged coins and slugs. This device tests coins for their electrical resistivity and density among other properties. If a coin fails this test, it is diverted back to the customer. If it passes, it then sets the machine in action. The clad coins proposed by the administration have precisely the same properties of resistivity and density as do the present silver coins and will, therefore, work without any cost or inconvenience in present coin mechanisms.

The vending industry constitutes a significant factor in the Nation's economy. Last year over 30 billion coins were inserted in vending machines by Americans to purchase \$3.5 billion worth of retail goods. These figures do not include the number of consumer transactions involving such coin-operated devices as coin telephones and coin-operated laundries.

Automatic merchandising has become an around-the-clock convenience in the modern age. The fastest growing application of vending in recent years has been in lunch and refreshment services for employees in factories, offices, hospitals, military bases, and for students and faculty in colleges and universities. An estimated 1.5 million Americans now obtain at least one meal a day from vending machines where they work and millions more rely on vended snacks and coffee breaks.

Any changes in the metal content of U.S. coins which would affect vending machines would, therefore, have a vital impact on the public as well as on food and refreshment services in most of America's business and institutional establishments.



The merchandise vending industry in the United States is composed of more than 6,000 small businesses that own and service most of the vending machines in operation. Operating on a thin profit margin many of the small vending companies could not sustain a period of shutdown, malfunctions, and public dissatisfaction resulting from a changeover to noncompatible coinage and would thus be forced into bankruptcy.

More than 80,000 persons are directly employed by vending-machine operators and manufacturers, a total payroll estimated at over \$600 million annually. These figures do not include the more than 300,000 additional persons whose employment derives from supplying the products and services required by vending companies. Any disruption of vending-machine operations could lead to dislocation and unemployment of a significant percentage of these wage earners.

The coinage recommended by the President will provide the United States with a coinage which will carry out fully and without interruption and disruption its function as a technical merchandising instrument. This is absolutely necessary for the public interest. I, therefore, strongly urge your approval of H.R. 8746 and its speedy enactment into law.

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SERVOMATION CORP.,  
New York, N.Y.

STATEMENT BY SERVOMATION CORP. IN SUPPORT OF H.R. 8746

Servomation Corp. is a national vending and food service company engaged in providing refreshment and food service through coin-operated automatic-vending machines in industrial plants, schools, hospitals, and other institutions. Through its more than 100 subsidiaries and 7,000 employees it operates in 30 States from coast to coast throughout the country and as a publicly held corporation listed on the New York Stock Exchange it represents approximately 4,500 shareholders.

Needless to say, Servomation, its employees, stockholders, and customers all have a vital interest in a rapid solution of the current coinage problem which will not be disruptive of its operations together with those of the vending industry generally.

We are well aware of the many interests which had to be considered by the administration in formulating any proposal for change in the Nation's coinage. We believe that it has achieved a sound and workable solution to this difficult problem and that its proposal embodied into H.R. 8746 should be speedily enacted into law.

The major feature of the bill which is the provision of a coinage which will be compatible with the existing coinage in all of the millions of machines presently in use and providing serve throughout the country, is of such paramount importance that it should not be allowed to be obscured by peripheral considerations not relevant to the basic problem and the basic issue. It should be stressed that the achievement of compatibility does far more than avoid the wastage of many millions of dollars in modifying present machines and the tremendous losses and inconveniences to the public from this process, important though these are. The fact is that a conversion of the coin mechanisms in the machines would not ameliorate the situation since the existing coins will of course continue to be used and the public would suffer as greatly from the rejection of such existing coins as it would from a failure of the machines to accept the new coins. Indeed this would serve to accentuate the shortage problem. Under the proposal contained in H.R. 8746, however, all of these problems will be successfully resolved.

Not only will passage of the legislation proposed bring a great and positive benefit; speed in such action is also urgently important, for such speedy action will end the uncertainties which inevitably hamper the needed expansion of facilities and services and will also reverse the tendency to hoarding which has operated to aggravate the coin shortage. Servomation Corp. therefore, in concert with the vending industry as a whole, strongly urges the Committee on Banking and Currency to act favorably and quickly on H.R. 8746.

Respectfully submitted.

JOSEPH E. McDOWELL, *President.*

INTERSTATE UNITED CORP.,  
*Lincolnwood, Ill., June 4, 1965.*

STATEMENT ON PRESIDENT'S COINAGE PROPOSAL

On behalf of our more than 8,000 employees, I respectfully submit this statement endorsing the President's proposal for new coinage.

We are in complete support of the U.S. Treasury bill on coinage. The proposed coins will work reliably in our present vending machines and will be welcomed by our customers in 31 States who increasingly depend on coin-operated equipment for goods and services 24 hours a day.

The passage of this legislation is vital to our company, its employees, and its customers. As one of the largest companies in our industry, we provide manual food service in more than 500 industrial and institutional locations throughout America. We also provide specialized food and vending services for hospitals, schools, and the military.

The passage of this bill provides an ideal solution to the crucial coinage problem facing our country. It assures an adequate and modern coin supply for our economy through the years ahead and works no hardship on the millions of men and women who comprise our industry.

May I respectfully urge swift passage of this important legislation.

ALEX KRAMER.

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QUAKER STATE COCA-COLA BOTTLING CO.,  
*Pittsburgh, Pa., April 6, 1965.*

HON. WILLIAM S. MOORHEAD,  
*House of Representatives,  
Washington, D.C.*

DEAR MR. MOORHEAD: Around April 15, the U.S. Treasury will recommend that Congress pass a law to change the silver content of our dimes, quarters, and half dollars. A change is necessary because our supply of silver is almost exhausted, but if Congress votes for new coins, which will not work in our present vending equipment, our operation will be in serious trouble.

We serve several thousand vending machines throughout industry and regular retail outlets dispensing soft drinks, food, candy, cigarettes, and milk, involving the services of many employees. We join the merchandise and vending industry urging a solution to the shortage of silver for coinage, which will cause the least confusion and inconvenience to the American public by assuring the continued operation of millions of existing coin mechanisms.

Accordingly, we advocate one or another of the following alternates in place of the present 90 percent silver alloy currently used in dimes, quarters, and half dollars:

1. A reduction in the silver content of the present silver-copper alloy coin to any combination of silver and copper which will work satisfactorily in present coin mechanisms.

2. A clad (laminated) coin made from outer layers of silver-copper alloy on a copper alloy core.

3. A clad (laminated) coin made of cupronickel outer layers on a pure copper core.

The first two solutions require the retention of a reduced silver content. The third requires no silver.

We are neither for nor against the retention of silver in the coinage. We support any solution which provides for coins that will function satisfactorily in existing coin equipment, thus assuring the American public of trouble-free operation with both present and new coins.

Very truly yours,

HOWARD W. CLOUGH,  
*Vice President, Sales.*



RADIO CORP. OF AMERICA,  
Camden, N.J., June 7, 1965.

Hon. WRIGHT PATMAN,  
Chairman, House Banking and Currency Committee,  
U.S. Congress,  
Washington, D.C.

DEAR CONGRESSMAN PATMAN: May I urge your support of H.R. 8746 in your current hearings.

Industrial food services rely heavily on the vending industry to provide daily food requirements to many millions of production and administrative employees throughout these United States. Any impairment to the smooth functioning of this important service, resulting from the use of improper coinage, would seriously penalize the food service industry and bring about substantial financial losses to the American business community.

Radio Corp. of America has made wide use of vending machines in its food service program and we would like to continue to have the benefits of this service in satisfying the food requirements of our employees.

I should like to request that my statement be made part of the record of your proceedings.

Yours very truly,

MARTIN O'SHAUGHNESSY,  
Administrator, Food Services.

GALLARNEAU BROS.,  
Amarillo, Tex., June 7, 1965.

Congressman WRIGHT PATMAN,  
U.S. House of Representatives,  
Washington, D.C.

DEAR CONGRESSMAN PATMAN: President Johnson has proposed a clad metal coin to eliminate the present coin shortage. I heartily endorse this proposal and ask that you give it your support.

We are vending machine operators serving an area with a radius of 150 miles from Amarillo, and employ 16 people. These machines provide a livelihood for us and serve the needs of our many thousand customers. The present coins will remain in use for a long time, so we must have coins that will work side by side with our present-day coins.

Our position all along has been that any coin that would work in the millions of coin-operated machines would be satisfactory with us. Since President Johnson has proposed a coin which will work, we ask that you give it your support.

Very truly yours,

J. B. GALLARNEAU.

KEY CITY VENDING CO.,  
Abilene, Tex., June 7, 1965.

Hon. WRIGHT PATMAN,  
Chairman, Banking and Currency Committee,  
House of Representatives, Washington, D.C.

DEAR MR. PATMAN: We wish to advise that the new U.S. Treasury bill on coinage meets with our approval and wish to urge your support of this most important solution to the problem of silver shortage for coins.

It is our understanding that this new coin will operate our vending machines as efficiently as the present coins. Since some 80 million coins are used each day in various types of vending equipment, you can easily recognize the urgency of supporting this proposed bill.

In our operation alone, there are about 10,000 daily purchases made with coins. This requires the service of 10 employees. We shall be very grateful if you will vote in favor.

Yours truly,

MARVIN LEWIS, Owner.

AMERICAN BOTTLERS OF CARBONATED BEVERAGES,  
THE NATIONAL ASSOCIATION OF THE SOFT DRINK INDUSTRY,  
Washington, D.C., June 7, 1965.

Hon. WRIGHT PATMAN,  
Chairman, Committee on Banking and Currency,  
U.S. House of Representatives Building, Washington, D.C.

MY DEAR CONGRESSMAN PATMAN: The American Bottlers of Carbonated Beverages, the national association of the soft drink industry, with a membership composed of 2,461 bottlers of soft drinks doing business in every State of the Union, is pleased to indicate to you the support of this industry for your bill H.R. 8746 to provide for the coinage of the United States. It is our considered judgment that the approach to coinage taken in this proposed legislation represents a realistic and workable solution to one problem caused by our country's diminishing silver supplies.

We are particularly gratified to note that the new coins which will be minted if H.R. 8746 becomes law in its present form, will be compatible with the coin mechanisms which are a part of the automatic vending machines through which so much of our product is dispensed. This is especially important to our members who have an interest in the over 883,000 bottle-vending machines on location at this time. These machines each sell an estimated 132 drinks per week for a total of 5,594,688,000 drinks per year.

It is not at all difficult to predict the chaotic effect on this vital sales segment of our industry if coins to be adopted did not work in these machines. As noted earlier, it appears that the coinage proposed in H.R. 8746 will be compatible with present equipment and, accordingly, the soft drink industry would like to take this opportunity to add its endorsement to that bill.

It will be greatly appreciated if our views on this legislation could be made a part of the record of the hearings of your committee on this subject. Thank you in advance for your consideration in this matter.

Very truly yours,

THOMAS F. BAKER,  
Executive Vice President.

SOUTHERN VENDERS, INC.,  
San Antonio, Tex., June 8, 1965.

Hon. WRIGHT PATMAN,  
U.S. House of Representatives,  
Washington, D.C.

MY DEAR MR. PATMAN: We are 1 of over 6,000 operators of automatic vending equipment who are vitally concerned with the coinage problem existing today. Coin-operated services are a vital part of the modern economy. Since the present coins will be in circulation for a long time, it becomes important that both types work in the millions of vending machines on which the American public has come to rely.

The Treasury proposal calls for clad metal coins, that will work perfectly in existing vending machines, interchangeably with present silver coins. No other new coin will work properly in our machines thus causing untold public confusion and irritation.

We sincerely ask that you support the President's recommendations and vote in favor for the U.S. Treasury bill on coinage.

We are,

Respectfully yours,

H. W. HARLIN, JR., Vice President.

STATEMENT OF RICHARD K. BANCROFT ON BEHALF OF THE COLUMBIUM FOR  
COINAGE ASSOCIATION

Mr. Chairman and members of the committee, my name is Richard K. Bancroft. I appear on behalf of the Columbian for Coinage Association. My purpose in appearing before the committee is to urge that columbium be considered as the material to be substituted in place of silver in the U.S. coinage system. I have been employed by the Union Carbide Co. for the last 19 years, first as a sales engineer and more recently as manager of product planning for the Stellite Division of the Union Carbide Corp. with offices in Kokomo, Ind.



My company, together with four others, has formed the Columbium for Coinage Association on whose behalf I am here today. The members of the association are as follows:

General Electric Co.  
Kawecki Chemical Co.  
Molybdenum Corp. of America.  
Union Carbide Corp.  
Wah Chang Corp.

The President's message on coinage has made it abundantly clear that "We have no choice but to eliminate silver for the most part from our subsidiary coinage." The question is what is the best substitute material for use in place of silver. The members of the Columbium for Coinage Association do not oppose the proposed clad coins in place of the 10-, 25-, and 50-cent silver pieces historically used in the U.S. coinage. Nevertheless, we believe that the adoption of the composite coin is likely to prove only an interim solution for the problems which are inherent in the coinage situation.

We believe experience with the new coins made of low cost base metal will show that the present rejection mechanisms used in vending machines in the United States will prove to be inadequate protection against "slugging." Certainly, the adoption of the composite coin will be a daily reminder to the public at large that a low cost cupronickel covering bonded to a copper base metal core will actuate the release mechanism of present-day vending machines. Indeed, we believe that in time the vending machine industry will become the principal victim of the proposed composite or sandwich type coin and will be obliged to devote substantial resources to finding a more sophisticated mechanism which will be more nearly proof against "slugging." Not only must there be more sophisticated mechanisms but these mechanisms must be designed around a metal such as columbium which has intrinsic value and unique characteristics which distinguish it from base metals such as copper and nickel which may be profitably used for slugging.

Now let me proceed to outline some of the affirmative merits of columbium as a metal for adoption in the subsidiary coinage of the United States. Attached to the statement which has been placed before each member of the committee is a copy of a more detailed document entitled "A Proposal for Columbium Coinage." This proposal has attached to it a commemorative medal made from columbium. I invite the members of the committee to remove this medal from its plastic jacket and to examine it in detail as I continue with my brief statement.

#### 1. HISTORY

Columbium is a basic element like gold or silver which was discovered in Connecticut prior to the Revolution and is named after the New World.

#### 2. PUBLIC ACCEPTABILITY

You will see that columbium is comparable to silver in weight, having approximately the same density, has a good "feel" and has a "ring" more like silver than nickel or any other base metal proposed for the coinage. It also has an attractive luster which becomes brighter with usage.

#### 3. WEARABILITY AND CORROSION RESISTANCE

Columbium is harder and tougher than either silver or nickel. Columbium thus has a high degree of wearability and resistance to corrosion. Only one other known metal, tantalum, is so highly resistant to corrosion.

#### 4. RESISTANCE TO COUNTERFEITING

Columbium has a far higher melting point than silver (4,400° F. as against 1,760° F. for silver) and moreover requires specialized processing (vacuum melting). These characteristics, together with the intrinsic value of the metal, all contribute toward making columbium both difficult and unprofitable to counterfeit or to convert into slugs for vending machines.

#### 5. WORKABILITY AND ADAPTABILITY TO MINT PROCESSING

Columbium is highly ductile, almost equally so with silver, and can be worked cold. Experimental columbium coins have already been struck by the Phila-

delphia Mint thus establishing that coins from columbium can be produced using the standard presses of the Government mints. Moreover, reproduction of detail, balance, and other characteristics are excellent.

#### 6. SUPPLY

Proven reserves of columbium ore are over 6 million tons, making it one of the most plentiful of metals. The largest deposits are in Brazil, Canada, and Africa with a substantial ore body at Powderhorn, Colo.

#### 7. AVAILABILITY AND COST

Within a period of 18 to 24 months following the adoption of columbium for coinage, production of this metal could be scaled up to meet any annual coinage demand in the range of 10 to 20 million pounds. Although today's commercial price for columbium is high for coinage purposes, because of limited industrial demand, it is certain that the price to the Government would be substantially reduced once there was an assured long-term market. For this reason, we think that the price of columbium should conservatively be estimated for present purposes as in the range of \$10 to \$15 per pound or less, which would be approximately one-half the present price of silver.

In this connection I call attention to the example of the descending price of titanium which in 1950 was priced at \$20 per pound and by 1962 had dropped to less than \$3 per pound, all this as a result of the normal response of price to increased production. The same result can logically be expected to occur with columbium.

#### POSITION OF THE COLUMBIUM FOR COINAGE ASSOCIATION

As indicated earlier, the association which I represent is not opposing the specific proposals which the President has made. However, we believe that these proposals, if adopted, will prove inadequate to a long-term solution of the problem and will lead to a tremendous increase in "slugging" of vending machines (of the present type). The adoption of sandwich coins will give notoriety to the fact that copper disks combined with any of several base metals of suitable weight can be joined together with ordinary household glues or even double-sided adhesive tape to provide a slug which will easily pass the vending machine devices now in use. Thus, we believe that the adoption of the sandwich-type coin will in a period of years render obsolete today's rejection mechanisms. Ultimately the vending machine industry, regardless of cost and inconvenience, will be obliged to develop more sophisticated rejection mechanisms than are presently in use. Because of its special characteristics, we believe columbium would make an ideal choice of metal for research on a more sophisticated rejection mechanism. The metallurgical and technical resources of the members of our association are available to assist engineers of the vending machine manufacturers in developing a rejector unit geared to the reception of columbium and of no other metal.

In conclusion my specific recommendations to the committee are as follows:

1. That the committee make specific provisions in the proposed legislation for an intensive study of the "slugging" problem;

2. That this study include consideration of the special advantages of columbium for use in more sophisticated vending machines which will be slug proof and thus serve the long-term interests of the vending machine industry;

3. That this study include consideration of the progressive introduction of columbium into the coinage beginning with 50-cent pieces, which would have the least adverse impact on existing vending machine use and yet would offer the greatest potential per unit protection against slugging losses when a new mechanism is developed. There is more than enough columbium in the Government's existing stockpile (14 million pounds) to assure an adequate initial supply for the new 50-cent pieces; and

4. That a representative of the columbium industry be included in the membership of the proposed Joint Commission of the Coinage.



A PROPOSAL FOR COLUMBIUM COINAGE, BY THE COLUMBIUM FOR COINAGE  
ASSOCIATION, WASHINGTON, D.C.

INTRODUCTION

The purpose of this proposal is to acquaint the Treasury, the Congress, and other interested groups with the characteristics and advantages of columbium which make it a superior candidate material for U.S. coinage, and to promote its adoption as a substitute for silver coinage.

A number of firms active in the mining, processing, and marketing of columbium have formed a group known as the Columbium for Coinage Association. This presentation has been prepared and is submitted by the association, whose members are:

General Electric Co.  
Kawecki Chemical Co.  
Molybdenum Corp. of America.  
Union Carbide Corp.  
Wah Chang Corp.

SUMMARY

Columbium has the characteristics required of a good coin material and in addition unique attributes which, if it were adopted as a substitute for silver, would retain the dignity and prestige of U.S. coinage.

Known world reserves of columbium exceed 6 million tons which is equal to known reserves of sulfide nickel ores. Columbium is abundant in this hemisphere and supplies in Canada and United States are amply for any emergency.

Present production capacity is between 1 million and 2 million pounds annually. With suitable long-term assurance of high volume demand, production could be brought to a level of 10 to 20 million pounds annually in a period of about 2 years.

In the quantity required for coinage, we estimate the price of columbium to the Government would be less than half the present price of silver. The use of columbium for coinage would so far exceed any current or envisioned applications of the metal that raw materials and stability of price could be readily assured the Government.

Publicity on "sandwich coins" has invited slugging of vending machine rejector devices now in use. What is now needed is a slug proof rejector device. It is believed such a device could be designed, built around the properties of columbium. We have confidence the combined technical skills of the columbium industry and the vending industry could solve the problem.

Establishment of a healthy columbium industry would be beneficial to the defense and space effort, nuclear power development, and would strengthen the economies of Canada, Brazil, and many other smaller free world countries such as Congo, Uganda, Kenya, Nigeria.

There are several reliable U.S. companies who are interested and capable of supplying columbium for U.S. coinage. This assures the Government of alternate and sustained source of metal.

Nickel and copper which have been prominently suggested for all U.S. subsidiary coins are base metals widely used and essential to many basic U.S. industries. Although there are ample world reserves of these metals, availability may depend largely upon one or a very few firms and, in time of national emergency, broad demand precludes availability for coinage. We have already had experience with "white" pennies and silver nickels.

COLUMBIUM FOR COINAGE

Columbium has the following properties and characteristics which make it an excellent candidate for a coinage material:

*Public acceptance*

Columbium is silver-gray with an attractive luster, is comparable to silver in weight, has a good feel, and ring more like silver than nickel or any other known base metal used for coinage.

*Wearability and corrosion resistance*

Columbium is harder and tougher than either silver or nickel and may be expected to have greater wear resistance and retain imprinted detail longer than either. Of all known metals and alloys, it is second only to tantalum in corrosion resistance, and luster should be enhanced by usage.

*Resistance to counterfeiting*

Columbium has the inherent ability to resist counterfeiting. Its high melting point (4,400° F.), specialized processing (vacuum melting) and intrinsic value all contribute to make counterfeiting both difficult and unprofitable.

*Workability and adaptability to mint processing*

Columbium is very ductile and can be worked cold. Experimental columbium coins have already been struck by the Philadelphia Mint, using their standard presses. Reproduction of detail, balance, and other characteristics are excellent.

*Sufficiency of supply*

Columbium ore reserves are over 6 million tons. This makes it one of the most plentiful of metals. Largest deposits are in Brazil, Canada, and Africa, with a substantial ore body in United States. Canadian columbium deposits alone would be enough to meet estimated coinage need of 5,000 tons annually for over 100 years, and at Powderhorn, Colo., reserves would sustain the same usage rate for over 30 years.

*Availability and cost*

Within a period of 18 to 24 months it is estimated columbium production could be scaled up to meet any annual coinage demand in the range of 10 to 20 million pounds.

Additional facilities needed for sustained high production would relate to mining and milling, extraction, reduction, and annealing. Ample melting and rolling capacity already exists.

At the outset, it is recommended that columbium strip or blanks be supplied the mint. Ultimately, there is no serious technical barrier to the mint assuming further "upstream" processing. Columbium does not require the extensive mills associated with steel or other hot rolled metal fabrication. Operations are clean. Because the metal is worked cold, much of the present mint equipment could no doubt be utilized.

Use of columbium in place of present silver coinage would create a columbium industry. This would be healthy for U.S. economy by establishing facilities furthering technology, and providing a sound base from which to expand all commercial refractory metals. Many industries as well as the space and military agencies would benefit.

However, the columbium producers would have to be assured of reimbursement for the additional capital investment necessary to produce the volume of columbium required for coinage. In this regard, it is suggested that long-term (10-year) contracts with suitable amortization would be appropriate.

Today's commercial price for columbium strip ranges between \$30 to \$40 per pound. Lack of industrial demand for the metal and its alloys keeps the price high. However, with a long-term assured market in the volume necessary for coinage, the price to the Government would conservatively be in the range of \$10 to \$15 per pound or less. Since columbium is about 80 percent of the weight of silver, this would mean an equivalent volume cost of about one-half the present price of silver.

Even the most optimistic industry forecasters agree that any single commercial use for columbium would never equal its usage for coinage if adopted and required in a volume of 10 to 20 million pounds per year. It is probable, even assuming columbium were someday used in gas turbine engines and other high-temperature, space, nuclear, and corrosion applications, the total volume required would not equal coinage requirements.

This then would give the Government a high degree of control over the supply and price of columbium raw materials and, thus, the stability of coinage.

Other important considerations which favor columbium include the following: Columbium offers a substitute for silver which will maintain the integrity and dignity of U.S. coinage.

The adoption of columbium for coinage would provide a final solution to the present problem and its abundance assures a stable coinage for a century or more.

Establishment of a healthy columbium industry would be especially helpful to the economies of Canada, Brazil, and many of the smaller countries of Africa and the free world. To Brazil, it would mean another major export to the United States and thus contribute substantial assistance to the political and economic stability of the country. To Canada, it would mean further development of columbium properties. To many smaller nations like Nigeria, the Congo, Kenya, and Uganda, it would help build financial independence.



## THE METAL COLUMBIUM

Columbium, sometimes called niobium, is an elemental metal. Along with tungsten, tantalum, and molybdenum, it is known as one of the refractory or reactive metals—refractory, because of its melting point (4,473° F.) and high strength at elevated temperatures, and reactive, because of its affinity for atmospheric gases at temperatures above 500° F.

*History*

Although discovered well over 100 years ago, columbium has a commercial history of only about 15 years. After World War II, during the period of intensive development of high-temperature alloys for the aircraft gas turbine, it was found that small amounts of columbium added to steels and cobalt- and nickel-base alloys enhanced properties by refining and stabilizing grain size. However, the metal was thought to be in very short world supply—almost in the category of rare earths.

Just before and during the Korean war, under the impetus of demand, intensive exploration revealed large deposits throughout the world and columbium is now known to be most plentiful. By far the greatest use of columbium is as an alloying addition to high-temperature alloys, chiefly as ferrocolumbium.

*Occurrence and world reserves*

Columbium occurs as columbite in alluvial deposits frequently associated with tin and in the mineral pyrochlore. Largest columbite sources are found in Africa and Malaysia with smaller deposits scattered throughout the world.

However, pyrochlore is by far the greatest source of columbium. Canadian deposits in the Oka district contain more than 1,250,000 tons of  $\text{Cb}_2\text{O}_5$  (about 875,000 tons of contained metal). Largest known reserve is the Araxa deposit in Minas Gerais Province, Brazil, where over 6,300,000 tons of  $\text{Cb}_2\text{O}_5$  (4.4 million tons of columbium metal) are proven. Other important reserves are in Africa. A recently discovered pyrochlore body in the Congo is reported as vast, but yet not fully evaluated.

In United States, there is an estimated potential resource of almost 150,000 tons of columbium metal—an ample supply for emergency use. Small columbium placer operations have been carried out in Idaho and a substantial pyrochlore deposit estimated to contain some 70,000 tons of columbium is located near Powderhorn, Colo.

Proven world reserves of columbium exceed 6 million tons, which is roughly equivalent to known reserves of sulfide nickel. Geologists say future discoveries will probably prove columbium to be as plentiful as copper.

Figure 1 shows major pyrochlore deposits in the free world as follows:

1. Molybdenum Corp. of America, Minas Gerais, Brazil.
2. St. Lawrence Columbium and Metals Corp., Oka district, Quebec.
3. Columbium Mining Products, Ltd., Oka district, Quebec.
4. Quebec Columbium, Ltd., Oka district, Quebec.
5. Beaucage Mines, Ltd., North Bay, Ontario.
6. N. V. Billiton Maatschappij, Tanganyika.
7. E. I. du Pont, Powderhorn, Colo.





Other firms having processing capability and active in the field to a lesser degree include:

Universal-Cyclops Steel Corp.  
General Electric Co.  
Kennametal, Inc.  
Mallinckrodt Chemical Works.  
Stauffer Chemical Co.  
Sylvania Electric Products, Inc.  
Temescal Metallurgical Co.  
Westinghouse Electric Corp.

#### *A. Extraction-reduction*

There are two methods used commercially for producing columbium metal from mill concentrates. One is by chlorination and subsequent sodium reduction. The other is by hydrofluorination and conversion to the oxide followed by carbon reduction to pure metal.

Some firms using the first method have developed proprietary means of continuous extraction-reduction to pure metal.

Present extraction capacity of the five major columbium producers is about 2,740,000 pounds of contained columbium per year. Total U.S. extraction capacity is estimated at 4 million pounds annually. Existing reduction capacity is in excess of 2 million pounds.

#### *B. Consolidation—Ingot production*

Three methods are used to convert the metal powders to bar or ingot for working to mill products: Sintering, vacuum-arc melting, and electron-beam melting.

Sintering is a powder metallurgy process in which the metal powder is pressed cold into a bar which is subsequently resistance heated for a long period in a high vacuum. The resultant product has good density and may be worked directly. This process is little used with columbium due to its relatively high cost and limited size bar which can be obtained.

In vacuum-arc melting, the metal powder is consolidated into electrode bars by cold pressing. The electrodes are then melted to ingot under high vacuum. Ingots weighing several hundred pounds can be produced.

Electron-beam melting is relatively new but is now most widely used for obtaining columbium ingot. With this process, electrons from a high-temperature element are focused in a magnetic field to produce a cone of intense heat into which pure metal powder or bar is fed. The metal drips into water-cooled copper molds. Ingots weighing several hundred pounds are produced. The entire process is carried out in very high vacuum.

Existing capacity of electron-beam melting is over 2,500,000 pounds of columbium ingot per year. Consumable vacuum-arc melting capacity is easily 10 to 20 million pounds. Adequate melting facilities are presently available for any conceivable demand.

#### *C. Mill processing—Forging, rolling, annealing*

Columbium begins to react with gases of the atmosphere (O-N-H) at a temperature of about 500° C. The result is embrittlement. Therefore, all forging, rolling, and drawing operations are done at room temperature. This is no problem because columbium is very ductile and is capable of 99 percent reduction before annealing is necessary.

Normal processing includes conditioning of ingot followed by cold forging and rolling on conventional mill equipment. Most strip and sheet are produced on Sendzimir mills.

Annealing is done in high-vacuum furnaces. Temperature required is 2,200–2,250° F.

Ample forging and sheet rolling equipment is available to supply any requirement of columbium sheet per year. Present capacity of high-temperature, high-vacuum annealing facilities is estimated at 1 to 1.5 million pounds of finished product per year.

Summarizing, present mining and processing capacity for columbium is as follows:

Operation	Pounds columbium per year
Mining and milling:	
Canada.....	1, 400, 000
Brazil.....	3, 000, 000
Other free world.....	3, 000, 000
U.S. stockpile <sup>1</sup> .....	14, 000, 000
Total.....	21, 400, 000
Extraction of concentrates.....	4, 000, 000
Reduction of oxide.....	2, 000, 000
Consolidation and melting.....	<sup>2</sup> 20, 000, 000
Forging and rolling.....	<sup>2</sup> 20, 000, 000
Annealing.....	1, 250, 000

<sup>1</sup> Available at outset. U.S. columbium deposits are available as reserves for emergency use.  
<sup>2</sup> Or more.

Properties of columbium

A. Physical properties

Density.....	0.31 pound/cubic inches (80 percent of silver).
Melting temperature.....	4,474° F.
Recrystallization temperature.....	2,200° F.
Modulus of elasticity.....	15×10 <sup>6</sup> p.s.i.
Electrical resistivity.....	12.5 microhm-cm.

B. Mechanical properties

Form	Ultimate, p.s.i.	YS, p.s.i.	Elongation (percent)
Sheet.....	53,000	37,500	26
Bar.....	41,500	28,500	45

NOTE.—Hardness, Rockwell B-40.

Applications

The greatest use for columbium is in the form of ferrocolumbium as an alloying addition to iron- and nickel-base alloys. Annual consumption in the United States is about 1,000 tons. Probably less than 50,000 pounds a year of pure columbium or columbium-base alloys is consumed as mill product. Principal applications are as tubing for molten salt experimental nuclear reactors and for nuclear fuel cladding. Also, columbium alloys are used as structural elements of experimental aircraft, missiles, and aerospace craft.

THE VENDING INDUSTRY PROBLEM

It is now a matter of public knowledge that copper disks combined with any of several other base metals of suitable weight ("sandwich" type coins) can be joined together with household glue or even adhesive tape to provide a slug which will easily pass the most sophisticated devices now in use.

The prospect is a growing slug problem which will make today's rejector units obsolete. It seems clear that the vending industry must change rejector devices despite the cost and inconvenience.

A long-term solution to the coinage problem is certainly the objective of both the Government and the vending industry. The latter also must be assured a slug-proof rejector mechanism. It is believed a device can be designed to accept only columbium coins which would provide the safeguard needed.

The metallurgical and technical skill within the companies who are members of the Columbium for Coinage Association is available to assist the engineers of vending machine manufacturers in developing a rejector unit to handle columbium.

Vending machine merchandising is surely destined to grow. Any coin or rejector device problem which exists today will only be compounded in the future. The coinage and vending problem requires a permanent solution—not an expedient. Columbium offers a plausible answer, and the columbium industry working



with the Treasury and the vending industry can work out a transition program which would minimize the effect of introducing new coinage, and the impact of changing vending equipment.

(Whereupon, at 11:10 a.m., the committee proceeded into executive session.)





## APPENDIX

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THE WHITE HOUSE, June 3, 1965.

### SUMMARY: A PROGRAM FOR A NEW AND MODERNIZED U.S. COINAGE

This summary of the President's coinage program, the Treasury staff study of silver coinage, and the study of alloys suitable for use as U.S. coinage are made available as background to the President's coinage program.

One underlying determination had to be made as the basic and fundamental decision affecting the U.S. coinage. This was: Will there be enough silver available to justify continued large-scale use of silver in U.S. coins?

The Treasury staff study of silver and coinage came to the unequivocal conclusion that there is not. (See point 1 of the Digest of the study, and pts. III and V of the study, and the table at the end of this summary.)

*There was no choice whether the United States should turn away from its traditional high silver content coinage at this time. It had to do so because to attempt to retain it in the face of a growing imbalance between silver supply and demand could only result in a severe and chronic national coin shortage in the not distant future.*

*There was a choice in only one matter: what substitute should be used for the existing 90 percent silver coinage?*

The Silver and Coinage Study provides a set of criteria for a modern coinage (see pt. II of the digest and of the study). The new coins the President is recommending to Congress meet these criteria:

*They will provide uninterrupted service as a medium of exchange. They can be made without further major changes for a long period ahead. They are made of materials for which there is assured access. They can be minted without undue difficulty and at moderate cost. They can be used—across the counter and in all of the 12 million coin-operated devices in use in the United States—side by side with the existing silver coins. These factors were determining in the selection of the new dime and a new quarter despite the fact that they have a distinctively different appearance from their traditional silver counterparts.*

The silver supply-and-demand situation is summarized in a table at the back of this document. It should be noted that:

In 1964, free world consumption of silver exceeded new production by a massive 335 million troy ounces—11,557 tons (see the last figure in the table). Even if no silver had been used anywhere in the free world for coinage, there would have been a silver deficit, on the average, from 1957 through 1961 and growing deficits in 1962, 1963, and 1964 (compare the first and the sixth columns of the table).

Coinage demand for silver has been growing fastest, and U.S. use of silver in coinage accounts for nearly all of this increase (see the second, third, and fourth columns).

The entire use of silver by the United States in coins, and in part the use of silver in the arts and industry in this country, are supplied from the Treasury's silver stock, acquired mainly in the 1930's. This stock now stands at approximately 1 billion ounces.

Thus, unless the United States acts now to ease its dependence upon silver in the coinage, the Treasury's large stock of silver would be gone in 2 to 3 years.

*Consequently, a new, largely nonsilver subsidiary coinage is proposed now, while the U.S. silver stock is large enough to insure an orderly transition to the new coinage, without danger of a coin shortage, and without major upsets to the silver market.*

Of the six coins in use in the United States, the new coinage program leaves three unchanged. These are the penny, the nickel, and the silver dollar.

With respect to the silver dollar:

(1) *The silver dollar remains unchanged as the coin it has been since 1837, a coin weighing 412½ grains overall, 90 percent of its weight silver.*

(2) There are no plans at present for new production of the silver dollar.

*The new dime and the new quarter.*—They will be the same size and have the same design as the present dime and quarter. But they are composite coins. They are faced with cupronickel, the alloy of 75 percent copper and 25 percent nickel now used in the 5-cent piece. The cupronickel facing is bonded to a core of pure copper. The copper core gives these coins their distinctive feature: a copper edge.

This type of coin was selected because it alone, among practical alternatives, can be used without interruption of service in all coin-operated devices in use in the United States, including the 6 million coin machines that have sensors set to reject anything other than the present 90-percent silver coinage.

This is a public convenience factor that was given great weight in making selections for the new coinage, in view of the following: In 1964 the public bought some \$3½ billion worth of goods and services, in more than 30 billion transactions, through merchandise-vending machines. The 1965 figures will be bigger, because this method of merchandising is expanding rapidly in the United States. The public has come to depend upon automatic merchandising for the provision of food and other small consumer items, at all times and in a growing number of places.

*The new half dollar.*—This too will be a composite coin. But it will be almost indistinguishable from the present half dollar. It will be the silver standard bearer of the new coinage, faced with an alloy of 80-percent silver and 20-percent copper, bonded to a core of approximately 21-percent silver and 79-percent copper, giving an overall 40-percent silver content. It will continue to be minted with the image of the late President Kennedy.

*The coinage program includes as a central feature the continued circulation of existing silver coinage.*

*Retention of the existing silver coinage in use for an indefinite period ahead means that:*

Both the old and the new coins must be accepted by the 6 million coin-operated devices in operation in the United States that use sensors set to reject coins other than the present silver money. They do this by rejecting any coin, or slug, that does not have the electrical properties of a coin with a 90-percent silver content. To be compatible in technical use, therefore, the new coins had to duplicate the electrical properties of the present silver coins. The proposed composite coins were engineered to do this. They do so precisely and consistently.

If an incompatible new coinage had been chosen, the sensors in coin machines could have been changed to accommodate them, at a cost estimated at approximately \$100 million. This cost did not enter into decisions as to the new coinage, since every industry must from time to time spend to keep in step with changes around it. The following factors were influential:

1. Changing the rejector devices in vending machines would impose upon the public service delays of 1 to 3 years.

2. Changing the rejector devices to accommodate a new coinage with electrical properties different from those of the existing silver coinage creates, rather than solves, a problem. This is so because setting rejectors to accept coins of variant electrical properties in effect desensitizes them, exposing them to extensive slugging. This would raise the cost of goods sold through coin operated vendors, as the losses through fraudulent use would be passed along to users in the form of higher prices for the goods and services sold through the machines.

The composite coins avoid all these problems.

Continued circulation of silver coins also means that the silver coinage must be protected from hoarding and destruction. This requires that the silver in them must not be permitted to become more valuable—as silver—than the face value of the coin.

*This will be prevented by continued action by the Treasury to hold the price of silver at not more than \$1.29 and a fraction cents a troy ounce. At this price it is uneconomic to melt existing U.S. silver coins for their silver content.*

The silver coinage will be protected in this way by the fact that the Treasury stands ready to supply silver from its stock at the \$1.29-plus price. It is expected that the transition can be made to the new coinage, the existing coinage can be protected, and the Treasury will still have a large supply of silver stock in hand at the end of 3 years.



Introduction of the new coinage into circulation will start next year, if legislation authorizing it receives prompt congressional approval.

Meanwhile, the mint will continue making the existing silver coinage.

The new coins will have the same purchasing power as present silver coins. They will be legal tender, exchangeable at full face value for all the financial instruments of the United States.

Use of the new coinage will permit an ultimate saving, in terms of the present pattern of coin usage, of 90 percent or more of the silver we now put into coins.

*Estimated free world silver consumption and production, 1949-64*

[Millions of fine troy ounces]

Calendar year	Industry and the arts	Use—Coinage demand			Total consumption	New production	Deficit
		United States	Foreign free world	Total			
1949-53 averages.....	153	36	48	85	238	174	64
1953-57 averages.....	190	37	36	74	264	191	73
1957-61 averages.....	216	47	51	98	314	200	114
1962.....	248	77	50	128	375	207	169
1963.....	252	112	56	167	419	214	205
1964.....	286	203	62	265	550	216	335

Source: "Treasury Silver Study," pt. III, table 1, figures rounded.

NOTE.—A troy ounce equals 480 grains, an avoirdupois pound equals 7,000 grains, a 2,000-pound ton equals 14,000,000 grains, hence, 1,000,000,000 troy ounces (480,000,000,000 grains) equal 34,285 tons.





# TREASURY STAFF STUDY OF SILVER AND COINAGE

UNITED STATES TREASURY DEPARTMENT  
1965

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## FOREWORD

This study has served as a basic document assisting in the development of policies to insure the adequacy of the United States coinage.

It is the result of research and analysis that has extended over the past 2 years. The objective was to consider all aspects and possibilities of the silver and coinage problems.

The study is made public as an informational service. In using it, account should be taken of the fact that since it was undertaken questions as to wear, and procurement, of some materials, then uncertain, have been answered.

One of the central aims of the study was the application of objective criteria for the development of a modern coinage system. The new coinage recommendations contained in legislative proposals being sent to the Congress meet the criteria for a modern United States coinage set forth here.

A critical part of the study was a thorough exploration of the silver supply and demand situation. This exploration provided the substance for the most basic decision that had to be made with respect to our coinage system: had it become unavoidably necessary for the United States to turn away from the large-scale use of silver in its coinage?

The conclusion of the Treasury Staff Study of Silver and Coinage that there is not a sufficient supply of silver to warrant the retention by the United States of its traditional silver coinage is supported by an independent study, commissioned by the Treasury, of the Battelle Memorial Institute, also being made public at this time, and by other inquiries into this subject.

Responsibility for the study was concentrated in the Treasury's Office of Financial Analysis. However, the study has been a cooperative undertaking to which personnel in the Bureau of the Mint, Office of Domestic Gold and Silver Operations, the Treasurer's Office, and the Office of the General Counsel have all contributed.

## Digest of the Treasury Staff Study of Silver and Coinage

[NOTE.—The study's final conclusions are summarized here, followed by a brief review of each of its sections]

### *1. Summary of Conclusions and Recommendations*

1. The fundamental finding of this study is that the world and the U.S. silver supply and production situation and outlook do not warrant continuation of the large-scale use of silver in the U.S. coinage.

2. Cupronickel is the best permanent material for a new subsidiary coinage, ignoring the vending machine problem. However, cupronickel coins would require "factory" adjustment of the coin rejectors in some 6 million coin-operated vending machines, entailing significant costs and public inconvenience.

3. Since extensive experiments confirm that cupronickel clad on a copper core operates successfully in unaltered vending machine rejectors, preferable options are available. Cupronickel-clad coins can be used during a transition period, or permanently. An overriding requirement with cupronickel-clad coins is the production feasibility of the strip and the assurance of an adequate supply for processing in the Mint.

6. Subsidiary silver coinage of reduced content, such as silver-copper alloys clad on a low-content silver-copper core, suffers both from difficult transitional problems and incomplete assurance that the subsidiary coinage would not be imperiled again within a fairly short period of time, due to the shortage of silver. If any silver is to be retained in the subsidiary coinage system, it should be limited to a clad silver 50-cent piece of 400 fineness. There is no suggestion that the silver content of the silver dollar be changed.

7. During the installation of any new coinage system, it will be obligatory to hold the market price of silver at its current level of \$1.29+ in order to protect the existing coinage. Since this will remove the incentive to melt the existing coinage, controls over melting would probably not serve any useful purpose. Effective controls on the hoarding of coin appear impractical. Controls on the export of coin may serve a useful purpose during the transition period. There is something to be said for having standby authority to invoke controls. A prompt transition to base alloy coinage would make the actual use of controls unnecessary.

8. New coins should be placed in circulation through normal channels. Every effort should be made as soon as possible to prepare for extremely high rates of production of the new coins.



## ***II. Criteria by Which a New Coinage Can Be Judged***

### ***Summary of Criteria***

The criteria are listed in the order in which they are discussed rather than in descending importance. However, it is felt that *the single most essential objective must be the facilitation of the orderly flow of financial and commercial transactions.*

A new coinage should meet the following principal criteria:

1. No interruption of essential medium of exchange function.
2. Promise of requiring minimum changes for a long period of time.
3. Assured access to raw materials.
4. Public acceptability in terms of—
  - a. Need for the change.
  - b. Technical characteristics of the coins.
  - c. Degree of inconvenience the new coinage imposes.
  - d. Absence of extreme hardship to any group or region.
5. Minting characteristics and coinage costs:
  - a. Assurance of high levels of production.
  - b. Minimization of dollar cost.
  - c. Minimization of any adverse impact upon balance of payments and international financial position.
6. Compatibility with present coinage:
  - a. Probable need for side-by-side circulation.
  - b. Vending machines usage.

## ***III. Silver Market Trends***

The discussion of silver market trends is divided into two parts. First, the dimensions of the growing imbalance in world silver markets are established and the implications for Treasury policy are discussed briefly. Second, the extent to which production and consumption of silver would adjust to higher prices is examined in order to reach a preliminary judgment as to the feasibility of reduced content silver coinage. [*To avoid misunderstanding, it should be stressed that while this preliminary examination of silver markets does not definitely rule out the possibility of a low-content silver coinage system, that possibility is ruled out by a later examination (Section V) of the specific difficulties of achieving a safe transition.*]

1. Recent years have seen the development of an enormous gap between Free World production and consumption of silver. The overall deficit, inclusive of coinage demands, was 200 million ounces in 1963 and almost 340 million ounces in 1964. Even if all coinage demands, United States and foreign, are subtracted, a deficit remains.

2. U.S. Treasury stocks of silver declined to 1,218 million ounces by the end of 1964 and may be down to 1,000 million ounces or less by mid-1965. Legislative action by 1965 on a new coinage system is essential while Treasury stocks of silver are still large.

3. On the basis of past experience, higher silver prices and increases in base-metal production promise to increase world silver production. The independent influence of higher silver prices cannot be estimated with any precision, but there is no reason to doubt that substantially higher prices would lead to some expansion in silver output. However, the current production deficit is so large that it cannot be closed from the production side.

4. During the last 15 years, most of the growth in the industrial consumption of silver has occurred in foreign countries; U.S. consumption has grown more slowly. There were some signs that the recent increases in silver prices had checked the overall growth in world industrial use of silver, but only temporarily, and in 1964 there was a sharp advance in silver consumption, here and abroad.

5. A simple extension of the postwar trend of silver prices suggests that \$2 an ounce might easily be reached by 1980 or 1985. Analysis of supply-and-demand factors does not yield any precise estimate of the level that silver prices might reach in a free market. The analysis does suggest that there is a very appreciable risk that the price could reach \$2 an ounce then, or even much sooner. Battelle's detailed quantitative projections of the rate of exhaustion of Treasury stocks lead to an even more pessimistic appraisal since with coinage of 50 percent silver content they can foresee the complete exhaustion of Treasury silver as early as 1969.

6. In view of these considerations, it does not appear that reduction of silver content to 800, 700, or 600 fineness would constitute a longrun (20- to 25-year) solution to the coinage problem. On the basis of longrun supply-and-demand factors, *there is an unmistakable risk that a rising market price of silver would soon imperil coinage of 500 fineness. That risk would be overwhelming even for lower silver contents if future U.S. coinage demand could not be met exclusively from Treasury silver holdings.*

#### ***IV. Metallurgical and Technical Characteristics of Alternative Coinage Alloys***

This section divides the possible coinage alloys into those that are acceptable *on technical and metallurgical grounds* and those that are not acceptable. Findings are summarized in the tables that follow.



# Acceptable Coinage Alloys

TABLE 1.—Summary of Coinage Alloys Meeting Minimum Standards of Metallurgical and Technical Acceptability

Material	Public acceptability				Operation in vending machines
	Weight	Color	Wearing qualities	Examples of foreign use	
Cupronickel or nickel silver clad on a copper core.	About the same as straight cupronickel or nickel silver.	Acceptable if the red edge of the coin is not regarded as objectionable. Test coins are very attractive.	Very good. Wear tests indicate an expected 20-30-year life. Only cupronickel cladding has been tested.	None.....	Exhaustively tested by Mint and rejector industry. Coins are expected to operate better than present silver coinage in existing, unaltered vending machines.
Nickel silver (65 copper, 18 nickel, and 17 zinc).	Good. Slightly lighter than pure nickel and cupronickel.	Excellent when minted but develops some yellow tarnish with age.	Good. Somewhat inferior to cupronickel.	Portugal, Philippines, Taiwan.	Practically the same properties as cupronickel and would operate in machines adapted to accept cupronickel.
Cupronickel (75 copper-25 nickel).	Good. Density, 8.9.....	Very good.....	Very good.....	Very widely used including U.S. 5-cent piece. Notable foreign users: United Kingdom, Spain, Norway, New Zealand, Australia.	Resistivity of 32.0 is too high for coins to work in 10-, 25-, and 50-cent channels.
Nickel (95 nickel- 5 silicon with magnetic core).	Same.....	.....do.....	Excellent.....	None.....	Not successful in achieving an acceptable success ratio under actual operating conditions despite intensive effort.
Silver-copper clad on copper or on low-content silver-copper core.	About the same as 500 silver-500 copper.	Acceptable. Low-content silver core removes or reduces the reddened edge of the coin.	Satisfactory.....	None.....	Will work alongside existing coinage. In the case of a pure copper core, minor modifications in alloy or adjustment of rejectors would be required.

## Acceptable Coinage Alloys—Continued

TABLE 1.—Summary of Coinage Alloys Meeting Minimum Standards of Metallurgical and Technical Acceptability—Continued

Material	Public acceptability				Operation in vending machines
	Weight	Color	Wearing qualities	Examples of foreign use	
Silver (United Kingdom alloy: 500 silver, 400 copper, 50 nickel, 50 zinc).	Very good. About the same as 500 silver-500 copper.	Very good when minted but develops dark tarnish and mottled appearance in circulation.	Fair. Addition of nickel and zinc improves wear characteristics somewhat.	Still circulates alongside cupronickel in United Kingdom. Formerly used very widely in British Commonwealth.	Because electrical resistivity is raised to 6.8, these coins would not work in most machines.
Material	Counterfeiting potential		Ease and certainty of production	Cost and availability of raw materials	Conclusion
	Actual counterfeiting	Vending machine			
Cupronickel or nickel silver clad on a copper core.	Very low potential. Red edge of coin is an advantage since clad materials are not readily available to the public.	Same as with present coinage.	Mint purchase of strip would be required at least for a time. Tests on production-sized lots indicate that no serious minting problems should be encountered. Much the same as cupronickel.	Readily available. Cost of clad strip will be substantially higher than straight cupronickel or nickel silver.	Acceptable as coinage material which will work in existing vending machines.
Nickel silver (65 copper, 18 nickel, and 17 zinc).	More counterfeiting potential than cupronickel, since nickel silver is readily available to the general public.	Same as cupronickel.....		Zinc is substituted for copper and some nickel in the cupronickel alloy. Zinc is cheaper and readily available.	Acceptable but would not work in 10-, 25-, and 50-cent vending machine channels.
Cupronickel (75 copper-25 Nickel).	Low risk.....	Appreciable risk—foreign coins.	Excellent.....	Cheap and readily available.	Acceptable. An excellent coinage material easily fabricated by the Mint. However, will not work in 10, 25, and 50-cent vending machine channels.



Nickel (95 nickel-5 silloncon with magnetic core).	-----do-----	Same as silver.-----	Purchase of annealed blanks would be required pending completion of new Mint.	Cost per pound of strip might be estimated at \$1.50.	Acceptable but a hard material difficult to stamp. Could not be manufactured with existing Mint facilities. Does not work in vending machines consistently under actual operating conditions.
Silver-copper clad on copper or on low-content silver-copper core.	Low potential.-----	Same as present coinage.-----	If production requirements exceeded Mint's melt-roll capacity, purchase of strip would be required. In any event, Mint would have to have all bonding operations performed in private plants until new facilities provided.	Availability is clouded by uncertainty as to size of Treasury stocks, if any, left after the period of transition.	Acceptable on technical and metallurgical grounds. While the bonding operation is no more difficult than in the case of cupro-nickel clad, existing melt-roll capacity limits the feasible output of the silver-copper clad on low silver-copper alloys. The silver supply situation remains as an overriding difficulty, as in the case of any silver alloy.
Silver (United Kingdom alloy: 500 silver, 400 copper, 50 nickel, 50 zinc).	Some eventual encouragement as worn coins become common.	The wider resistivity range needed to accept these coins and existing coins would encourage the use of slugs made from such materials as zinc.	Much more difficult to produce than 500 silver-500 copper. Would require double melting.	Some reduction in present raw materials cost because of lower silver content. Availability of silver is clouded by uncertainty as to the size of Treasury stocks left after the period of transition.	Barely acceptable because of bad appearance when worn and need for vending machine changes. The silver supply situation remains as an overriding difficulty, as in the case of any silver alloy.

Not Acceptable Coinage Alloys

TABLE 2.—Summary of Coinage Alloys Not Meeting Minimum Standards of Metallurgical and Technical Acceptability

Material	Public acceptability				Operation in vending machines
	Weight	Color	Wearing qualities	Examples of foreign use	
Aluminum	Very poor. Density, 2.71	Good	Fair to poor	Low denomination coins in poor countries. Also some use in Austria, Japan, Italy.	Resistivity of 2.65 is near to that of present coins. Hardening agents raise resistivity. Coins too light to work in vending machines.
Columbium	Fair. Density, 8.6	Good. Silver-gray	Very good	Not used anywhere	Resistivity of 12.5 to 16 is unlike that of most other coinage materials. Rejectors would have to be adapted unless columblum metal were clad on a copper core. No satisfactory material of this sort has been presented to Battelle or the Mint for testing.
Nickel (pure)	Good. Density, 8.9	Very good to excellent	Excellent	Canada, France, and South Africa.	Magnetic and will not be accepted by existing coin rejectors. Complete redesign of rejector units would be required.
Silver (500 silver and 500 copper).	Very good	Excellent at first if given acid bath.	Very poor. Wear quickly exposes yellowish and reddish areas beneath the silver surface coating.	None. South Africa was the only country still using it and is now substituting pure nickel.	Coins work with only very minor adjustments needed on some machines.



Stainless steel.....	Fair. Density range, 7.8 to 8.0.	Good.....	Excellent.....	Italy, Turkey.....	Won't operate in existing 50-, 25-, and 10-cent vending machine channels. Won't work. Too light. Zirconium resistivity, 40—Hafnium, 35.
Titanium.....	Poor. Density, 4.5.....	Whitish-gray.....	Very good.....	None.....	
Zirconium-hafnium.....	Fair. Zirconium density, 6.49.	Good.....	(?).....	do.....	
Also rejected: Copper 98-zinc 2, plastics, and steel coins with cladding.					
Material	Counterfeiting potential		Ease and certainty of production	Cost and availability of raw materials	Conclusion
	Actual counterfeiting	Vending machine			
Aluminum.....	Very great risk.....	Very great risk.....	Very good.....	Cheap and abundant. Coinage requirements negligible proportion of total consumption.	Rejected. Poor weight and appearance. Vending machine and counterfeiting problems.
Columbium.....	Very low risk.....	Very low risk.....	Probably OK.....	Prohibitive cost and uncertain supply outlook.	Rejected. Prohibitive cost and uncertain supply plus need to adapt vending machines.
Nickel (pure).....	do.....	No basis for judgment.....	Very difficult problem for the Mint. Purchase of strip would probably be required pending completion of new Mint.	Relatively cheap at \$0.79 a pound. Would involve dependence upon imports from Canada or use of excess nickel from strategic stockpile.	Rejected. Magnetic, hence won't work in vending machines. Difficult to fabricate.
Silver (500 silver and 500 copper).	Some eventual encouragement as worn 500 coins become common.	Very little different from present situation.	About a 10 percent increase in operating cost over present levels. No really new problems would be encountered and high levels of production could be achieved.	Some reduction in raw materials cost because of lower silver content. Availability is clouded by uncertainty as to the size of Treasury stocks left after the period of transition.	Rejected because of very bad appearance when worn.

Not Acceptable Coinage Alloys—Continued

TABLE 2.—Summary of Coinage Alloys Not Meeting Minimum Standards of Metallurgical and Technical Acceptability—Continued

Material	Counterfeiting potential		Ease and certainty of production	Cost and availability of raw materials	Conclusion
	Actual counterfeiting	Vending machine			
Stainless steel.....	Very low risk.....	Considerable risk on the basis of what is known at this time.	Very difficult minting process. Strip would have to be purchased.	Low cost and assurance of required quantities. No domestic production of chromium.	Rejected: Doubtful acceptability, vending machine and difficult production problems.
Titanium.....	do.....	Uncertain.....	No Mint experience.....	Strip is estimated to cost about \$5 per pound. Supplies probably adequate for Mint requirements.	Rejected: Too light, too expensive, and no vending machine work done to date.
Zirconium-hafnium.....	Negligible risk.....	do.....	do.....	Zirconium strip would cost \$8 per pound. Suggested addition of hafnium would raise cost near that of silver.	Rejected: Prohibitive expense and need to adapt vending machines. No work done on the problem.

Also rejected: Copper 98-zinc 2, plastics, and steel coins with cladding.



## ***V. Problems With a Changeover to Reduced Content Silver Coinage***

The present section examines the feasibility of achieving a successful transition to a new coinage system using low-content silver alloys. An appendix considers the possibility of a silver 50-cent piece of 400 fineness. Major conclusions can be summarized as follows:

1. The transition to silver coinage of reduced content would be an extremely risky undertaking, and Treasury silver stocks would probably be depleted within a relatively short period of time. If there is a partial and limited exception to this overall conclusion, it arises with 400 fineness where a high proportion of the existing coinage is recovered at a rapid rate.

2. Even there the risks would have to be judged intolerably great unless there were clear evidence, at the time a decision was reached, that the coin shortage had ended and subsidiary coinage was temporarily redundant.<sup>1</sup> No one could be sure in any case that the price of silver would not be driven again to the melting point of subsidiary coinage; this might not occur within the immediate future. *In general, analysis of the special problem of the transition to reduced content silver coinage suggests that attention can appropriately be concentrated from this point in the study upon the base alloy alternatives.*

## ***VI. The Relative Merits of the Base Metal Alloys***

This section first considers the respective merits of the four remaining alloys: cupronickel, nickel silver, 95 percent nickel (Inco coin), and cupronickel clad on a copper core. The nature of the production effort required for a smooth transition is described and the possible use of controls is examined, and largely rejected. Major conclusions are summarized below.

1. Assuming that vending machine rejectors were to be modified, the choice of permanent coinage material lies primarily between cupronickel and nickel silver. The difference between these homogeneous alloys is not great, although in most respects cupronickel is slightly superior. The preference would be for cupronickel subsidiary coinage with the present 5-cent piece unchanged.

2. The cupronickel (or nickel silver) clad on a copper core has the great advantage of avoiding the need for modification of vending machines. The Inco coin does not work acceptably, and, even if it did, it would be superior to the clads only on the basis of appearance. The clad coin is to be preferred since it would lead logically and easily to a permanent coinage of cupronickel, or nickel silver, or, as seems equally desirable, could be retained as the permanent coinage material.

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<sup>1</sup> This is clearly not the case at the present time.

3. Full replacement of the existing subsidiary coinage with straight cupronickel could be achieved in less than 3 years with existing and planned Mint capacity, even more rapidly if capacity were expanded further. The Mint is conducting an exhaustive investigation of the supply situation in the case of cupronickel clad on copper.

4. Standby authority to impose controls on the melting and export of coin might be a useful backstop. A prompt transition to base alloy coinage would make the use of controls unnecessary.



## **TREASURY SILVER AND COINAGE STUDY**

### **I. Introduction**

This study examines the silver coinage problem and evaluates ways in which that problem can be resolved. It draws upon a range of previous Treasury studies and memoranda in arriving at its specific recommendations for a new coinage system. Some sections of the present study, particularly those dealing with the metallurgical and technical characteristics of alternative coinage alloys, have also benefited from findings of a parallel study for the Treasury by the Battelle Memorial Institute. Other sections of the present study incorporate information that has been made available to the Treasury by private groups and by other government agencies. The published literature dealing with the silver situation and with suggested changes in our coinage system has been examined.

## II. Discussion of the Criteria by Which Any Future Coin Program Should Be Judged

The selection of a set of criteria by which alternative coinage systems are to be judged necessarily involves a prior view as to what a coinage system should do and how it should do it. This study takes it to be axiomatic that, under modern conditions, the primary and essential function of a coinage system is to assist the unimpeded flow of transactions throughout the economy, by acting as a medium of exchange.

There are collateral objectives; for example, the preservation of historical tradition, the minimization of costs to the private sector of any transition to a new coinage system, the avoidance of strain upon the balance of payments, the maximization of Treasury "profit" (seigniorage) on coinage operations. No single plan for a new system will be able to achieve fully all of the ends that are desirable in themselves.

The importance of the coinage system to overall economic and financial activity is so great that any compromises should be between the attainment of the various subsidiary objectives, and not at the expense of the major objective of continuing to provide a reliable medium of exchange.

### A. Permanence of the Program

No alteration in our coinage system is likely to guarantee complete immunity from the possible future need for modification. An ideal program should offer assurance against a shortage of coinage materials for a long period into the future. The likelihood of any disruption within 5 to 10 years should be regarded as disqualifying.

### B. Raw Material Requirements

The raw materials needed in a new coinage system should be readily available, preferably from domestic production or excess stockpiles. *Silver and base-metal alloy systems* pose somewhat different problems in this respect. With silver coinage of reduced content, the major problems are the extent to which a higher silver price would deter industrial uses, encourage exploration activity, and stimulate mine production; the degree to which existing Treasury silver stocks at the time of the transition would be conserved by lower silver content per coin; the effective addition to Treasury silver supplies made possible by the capture of higher content coins in circulation at the time of



the transition; and the extent to which the existing silver coinage might be lost from circulation at the time of the transition; and the extent to which the existing silver coinage might be lost from circulation by being hoarded, melted down, or exported. *With base-metal alloys*, the questions are the relatively less complex ones of the availability of whatever raw materials are required as an input into coinage manufacture, and the strength of competing demands in relationship to prospective supplies.

In the case of silver as well as base-metal alloys, there is the question whether a coinage system is acceptable only if its materials can be found domestically at reasonable cost, or if imported materials could be used. From the standpoint of security, it would probably be sufficient if there were substantial domestic, or even North American, supplies relative to maximum potential coinage demand and other vital uses during an emergency period. It is true that for a time during World War II silver had to be used in the 5-cent piece because of the shortage of nickel and copper, and the 1-cent piece was made of zinc-coated steel. Certainly, it would be unwise for a coinage program to involve a major continuing dependence upon a foreign source for raw materials if there were strong indication that supplies might be interrupted because of revolution, expropriation, strikes, etc.

### C. Public Acceptability

The feasibility of a change in our coinage system rests upon the general agreement of the public that such a change is necessary and desirable, and upon the reasonableness of the proposed change. It seems probable that the main element in public acceptability will be (1) demonstrated necessity of the change, (2) characteristics of the new coins, (3) degree of inconvenience to which the public is subjected by the change, and (4) absence of extreme hardship suffered by any particular group or industry as a result of the change.

#### *1. Need for the change*

In view of the silver situation, present and prospective, the existing system of subsidiary coinage cannot possibly be continued for much longer.

#### *2. Characteristics of the new coins*

The new coins should be similar in size, weight, ring, and color to present coinage. It seems probable that in the new series as in the old only the 1-cent piece should be red in color. New coins should have wearing qualities not greatly inferior to those of the present coinage, and any increase in durability would be a valuable dividend.

It is assumed from the outset that the existing diameter and thickness of U.S. coinage will be continued. On the assumption that it is desirable to retain some continuity with the past, it can also be argued that the retention of silver in our subsidiary coinage is desirable. Cer-

tainly, there is no question that continuation of subsidiary coinage of the present silver content would offer many advantages. Because that is not possible, the main choice comes down to subsidiary coins of lower silver content and coins of no silver content.

### *3. Degree of inconvenience*

Inconvenience to the public would be minimized if new coins have desirable technical characteristics, are readily available in required amounts, and can be used with confidence in present coin-operated devices.

Inconvenience will also be reduced if new coins can be placed into circulation through normal channels in the ordinary way, rather than by requiring the public to exchange old coins for new. The exchange approach would involve complications such as having large numbers of exchange locations; an adequate inventory of new coins for exchange purposes at each location; educating the public regarding the exchange, etc. New legal prohibitions should be held to the irreducible minimum consistent with the protection of existing coinage and the achievement of a smooth transition to the new system.

### *4. Absence of extreme hardship*

A new coinage program should avoid inflicting a demonstrably serious hardship upon a particular group or industry. The coin-machine industry could claim such hardship if new coins did not work in its machines. The manufacturers of rejector devices could claim a serious hardship if a proposed period of transition to the new system were too short to allow an orderly adaptation of existing equipment, if adaptation is required. A considerable hardship to the public at large would arise if the usefulness of coin-operated devices were seriously impaired over a long period of time. Silver producers could claim that a new coinage system that threatened to lead to a sharp fall in the price of newly mined silver would place an undue burden upon them. Silver users could claim that a new coinage system that promised to lead to a sharp increase in the price of refined silver would be inequitable.

## **D. Minting Characteristics and Coinage Costs**

Relative ease and certainty in the manufacturing process for new coins is particularly desirable in view of the current coin shortage. There are some signs that the coin shortage has been alleviated to a certain degree. Even so, the need will remain for an assured transition to high levels of output for the new coins, particularly since large amounts of any new coin are likely to be taken out of circulation temporarily by the public. However, feasibility from the production side would have to be clearly demonstrated if new materials or new processes were to be used.



The minimization of the manufacturing cost of a given system of coins of acceptable quality is desirable as a simple matter of efficiency. There is general agreement that within the limitations with which they have had to work, Mint operations have been conducted very efficiently. A slightly broader aspect of the cost question is whether or not the Treasury should seek to achieve the lowest possible total coinage cost, inclusive of materials used. Unless it can be shown that higher cost does for some reason make coins more acceptable, there would seem to be reason to favor low-cost coinage.

The possibility must be examined that the potential scope for counterfeiting would thereby be encouraged, although this does not appear likely to be of consequence in the case of any alloy that would be acceptable on other grounds. Aside from seeking the minimum level of materials and manufacturing costs consistent with coinage of acceptable quality, there is a case under present circumstances for holding the foreign exchange cost of coinage to reasonable proportions. It will also be essential to insure that the transition to a new system of subsidiary coinage does not have harmful side effects on the international position of the dollar.

#### **E. Compatibility with Present Coinage**

The production requirements for a new coinage system can be eased if there is side-by-side circulation of new and old coins during the period of transition. The only exception would arise if it were believed that an entire set of new coins could be produced and the substitution of new for old coins made in one step. This does not appear to be an available alternative at the present time. Because of the coin shortage, it is necessary to keep Mint facilities fully employed on the production of coins of the present type. Therefore, it is particularly desirable that a new coinage system provide for a high degree of side-by-side circulation of new and old coins.

In addition to minimizing production problems and protecting the existing coinage, it would be desirable that new and old coins be compatible in the sense of working in existing coin machine rejectors. If this is not possible, problems will be eased to the extent that the required modification of rejectors can be made within a reasonably short period of time at an expense that is not prohibitive.

### III. Silver Market Trends

The present section discusses recent trends in silver markets and the implications of these trends for a new coinage system. The discussion falls into two major divisions. First, recent developments in silver consumption and production are examined at world, foreign, and U.S. levels. This concludes with a review of what has happened to Treasury silver stocks and what is likely to happen to them in the near future. Second, with this background established, the discussion turns to the special problem of the effects that higher silver prices might be expected to exert upon world and U.S. consumption and production of silver.

#### *World Production and Consumption*

Since World War II, and particularly since 1958, there has been a widening gap between Free World silver consumption and production. Continuing pressure upon U.S. silver stocks is basically attributable to that gap between Free World production and use of silver, although in any given year imbalances have been met from a variety of sources including use of silver stocks, demonetized coin, liquidation of private holdings of silver, and, for a time, sizable sales by Red China.

The relatively sluggish expansion of silver production in the face of rapidly expanding consumption may be seen in Table 1 which estimates Free World silver consumption and production since 1949. It will be noticed that Free World silver production has risen only moderately since 1958, and has averaged about 205 million ounces annually over the entire period 1958-64. In that same period, world consumption of silver, for coinage and industrial use taken together, has just about doubled. As a result, the sizable annual deficits of 65 to 70 million ounces that were the rule from 1949 to 1958 had tripled to a massive 205 million ounces by 1963, when silver usage grew to twice new silver production, despite an appreciable production increase in 1963. Data for 1964 are still subject to revision but they suggest an overall deficit of 325 to 350 million ounces, with estimated total usage up to more than two and one-half times the estimates of total new production.

The "indicated deficits" of table 1 are gross measures of the degree of disequilibrium that has existed in world silver markets. They



considerably overestimate the excess demand that has actually impinged upon world markets, chiefly because of the inclusion of U.S. coinage demand in overall consumption. U.S. coinage demand has been met from official stocks, not from new production. From some standpoints, it is the balance between production and industrial demand, alone, that is of interest. Therefore, the indicated deficit in Table 1 is also shown exclusive of total coinage demand, and U.S. and foreign coinage demands are shown separately so that other measures of the deficit can readily be computed. Foreign coinage demand is, by and large, met in the market. But, in terms of the overall balance between world consumption and production, inclusion of all demands is the indicated course to follow, whether met from existing stocks or current output. Indeed, it might even be argued that U.S. coinage demand should be increased to include the amounts of old silver dollars placed in circulation during recent years. To do so would raise 1963's indicated deficit by more than 50 million ounces.

Although the indicated deficits cannot be interpreted literally as measures of excess demand, these gross statistics do show most clearly the drastic alteration that has taken place in world silver consumption and production, and the overall dimensions of the Free World production deficit. It is particularly significant that in each of the last 6 years the use of silver in industry and the arts has, itself, exceeded new production.

TABLE 1.—*Estimated Free World Silver Consumption and Production, 1949-64*

[In millions of fine troy ounces]

	Industry and the arts	U.S.A.	Coinage demand, foreign	Total	Total consump- tion	New produc- tion	Indicated deficit (-)	Deficit excluding all coinage demand (-)
	(1)		(2)		(3)	(4)	(5)	(6)
1949-53 average.....	153.1	36.5	48.2	84.7	237.8	173.9	-63.9	20.8
1953-57 average.....	190.1	37.5	36.0	73.5	263.6	191.0	-72.6	.9
1958.....	190.5	38.2	41.3	79.5	270.0	205.8	-64.2	15.3
1959.....	212.9	41.4	45.0	86.4	299.3	188.4	-110.9	-24.5
1960.....	224.6	46.0	57.9	103.9	328.5	206.9	-121.6	-17.7
1961.....	239.5	55.9	81.2	137.1	376.6	203.0	-173.6	-36.5
1962.....	247.8	77.4	50.2	127.6	375.4	206.9	-168.5	-40.9
1963.....	252.2	111.5	55.5	167.0	419.2	213.8	-205.4	-38.4
1964.....	285.9	203.0	61.5	264.5	550.4	215.5	-334.9	-70.4

Source: Columns (1) and (2) are from Handy and Harman, *Annual Reviews*. Column (4) is derived from the world totals published in the *Annual Reports of the Director of the Mint* and compiled by the Bureau of Mines. Production for the following countries has been subtracted from the world totals: Czechoslovakia, East Germany, Hungary, Rumania, Poland, U.S.S.R., China, and North Korea. The world production estimate for 1963 is from the Bureau of Mines, *Mineral Industry Surveys*, August 21, 1964; and that for 1964 is from Handy and Harman, *Annual Review*, 1964, adjusted on the basis of the 1958-63 relationship between the Handy and Harman and Bureau of Mines estimates.

This strongly suggests the possibility that, even if coinage demand for silver were to dry up entirely, there would still be an appreciable gap between the world's industrial consumption of silver and prospective levels of silver produced at current prices. Since U.S. coinage requirements have been met from existing stocks of silver, market demand would not be directly affected if the United States were entirely to discontinue the use of silver in coinage. If other countries were also to abandon the use of silver for coinage, and if their demands had previously been met from current production, there would be some resulting effect upon market demand. But, total consumption requirements would still appear quite likely to continue to exceed current production at the price-cost relationships now existing in the silver industry. In 1963, for example, it will be noticed from Table 1 that there was an indicated Free World deficit of about 40 million ounces wholly aside from coinage demand, and this deficit appears to have widened to 70 million ounces, or so, in 1964 when speculative purchases of silver again became important, as they were in 1961.

The possibility that a sharp reduction in coinage demand would still find silver in relatively short supply in world markets does not take into account the effect on silver prices of any ultimate disposition of existing official stocks. World silver stocks in official hands outside of the United States are believed to be quite modest in size. On the basis of the statistics presented in the *Annual Report of the Director of the Mint*, they would appear to total little more than 100 million ounces. As for this country, at current rates of U.S. coinage demand and bullion redemptions, the question is scarcely one of how to dispose of any residual U.S. official stocks without disrupting the market. Existing U.S. official stocks of silver are likely to be no more than adequate for the short-run stabilization of world silver prices which the United States will find essential in making an assured, trouble-free transition to a new coinage system. Even if the decision is to replace silver subsidiary coinage with a base alloy, some silver might be required after the transition period for stockpile or other purposes.

Unless one envisions some radical departure from the recent pattern of world industrial consumption and production of silver, demand for silver appears certain to be strong over the long run, even if silver is very largely abandoned as a coinage material.

### **Free World Silver Production and Consumption Outside the United States**

Until recent years there had been approximate balance between silver production and consumption outside of the United States, but, in the last few years, overall deficits of some size have begun to ap-



pear. Table 2 estimates foreign silver production and consumption, 1949-64.

### *Consumption*

The rise in foreign use of silver in industry and the arts has been very great. It is estimated that Free World foreign industrial use of silver may have amounted to something like 60 million ounces prior to World War II. That level had been regained by 1953. A period of rapid growth in silver consumption then led to more than doubling of the 1953 level by 1961. Industrial demand in Canada, United Kingdom, France, West Germany, and Japan rose more or less steadily from an average 35.8 million ounces in 1949-52 to an average 96.4 million ounces in 1959-62. The increase in the industrial use of silver has been most striking in West Germany and Japan. There was some indication of a reduced rate of growth in Free World industrial use of silver outside the United States during 1962 and 1963, probably due to the effect of the increasing price of silver in those years. However, as the price of silver remained at the ceiling imposed by the monetary value of the U.S. silver dollar during 1964, the growth in foreign industrial use of silver was very sizable, some 20 million ounces on the basis of preliminary data.

Foreign coinage demand remained relatively stable through 1959, averaging about 40 million ounces annually. It then rose appreciably in the period from 1960 through 1964, when it averaged some 65 million ounces annually, with a good part of this increase accounted for by the French coinage program. Future coinage demand in the Free World outside of the United States is difficult to estimate, but few observers see much likelihood of any marked further expansion from present levels. Foreign coinage demand might very possibly decline.

### *Production*

Production of silver in the Free World outside the United States increased fairly steadily until 1958. It then reached a temporary plateau, before increasing by about 8 million ounces in 1963. Preliminary reports suggest that foreign production in the Free World did not rise by a similar amount during 1964. As a result of relatively slow overall growth in production and rapidly increasing demand, the surplus of new production over consumption, which had already begun to narrow sharply after 1954, disappeared altogether in 1960. Deficits have been substantial since that time. The indicated deficit, including coinage demand, has averaged a little less than 30 million ounces annually in the last 5 years. The deficits were larger in 1961 and 1964, partly, it would seem, because of some speculative purchases of silver in each of those years. Excluding coinage demand, production of silver in the Free World outside the United States has exceeded consumption by an average 32 million ounces during the last 5 years, but this surplus fell in 1964 to 13 billion ounces.

TABLE 2.—*Estimated Foreign Silver Consumption and Production, 1949-64*<sup>1</sup>

[In millions of fine troy ounces]

	Average, 1949-52	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
Industrial uses:													
Canada.....	4.7	4.7	3.9	4.6	3.8	5.8	4.6	4.5	4.3	4.5	4.6	4.6	4.8
United Kingdom.....	12.4	11.9	12.6	14.2	13.8	14.7	14.8	17.5	16.5	20.0	20.0	20.0	23.0
France.....	7.4	14.5	15.0	15.7	15.9	17.9	14.1	10.6	13.0	14.0	13.5	13.9	14.8
West Germany.....	8.5	11.9	24.2	28.1	31.5	33.1	31.1	33.3	40.2	43.5	41.8	40.5	46.3
Japan.....	2.2	5.6	5.8	6.3	7.9	8.8	8.2	13.6	21.6	19.1	19.6	20.0	20.0
Other countries.....	12.3	14.7	14.3	23.9	43.0	37.3	32.7	30.4	29.0	33.4	38.3	43.2	54.0
Total: Foreign industrial uses.....	47.5	63.3	75.8	92.8	115.9	117.6	105.5	109.9	124.6	134.5	137.8	142.2	162.9
Foreign coinage demand.....	48.3	48.0	30.2	44.4	35.4	32.2	41.3	45.0	57.9	81.2	50.2	55.5	61.5
Total foreign consumption, industrial and coinage.....	95.8	111.3	106.0	137.2	151.3	149.8	146.8	154.9	182.5	215.7	188.0	197.7	224.4
Total foreign production.....	131.4	148.8	146.3	154.9	153.7	158.6	169.0	165.4	170.1	168.1	170.6	178.6	179.5
Indicated deficit (-).....	35.6	37.5	40.3	17.7	2.4	8.8	22.2	10.5	-12.4	-47.6	-17.4	-19.1	-44.9
Surplus, excluding coinage demand.....	83.9	85.5	70.5	62.1	37.8	41.0	63.5	55.5	45.5	33.6	32.8	36.4	16.6

<sup>1</sup> Estimates exclude the Sino-Soviet bloc.<sup>2</sup> Average, 1950-52.Source: Handy and Harman *Annual Reviews, Annual Reports of the Director of the Mint,* and Table 1.



## U.S. Production and Consumption

### *Consumption*

In contrast to the very rapid growth in foreign silver consumption, industrial consumption of silver in the United States has not changed greatly in the postwar period. As shown in Table 3, industrial consumption averaged about 100 million ounces during 1949–52 and had only risen to about 110 million ounces by 1963, although it apparently increased to more than 120 million ounces during 1964. There is some evidence of a cyclical pattern, with declines in 1954 and 1958, but not much sign of the sharp upward trend that has characterized foreign silver consumption in most of the postwar period.

Detailed statistics on the uses of silver consumed in industry are scarce especially in the case of foreign countries. However, the U.S. data presented in Table 4 give some indication of the relative importance of silver in various uses and of the changes that have taken place since 1959. The general picture is one of relatively rapid expansion in newer uses—batteries, electrical and electronic components—and some contraction in more traditional uses—silverware and jewelry. Photographic use remained about constant from 1961 through 1963, before increasing substantially in 1964. These end-use statistics suggest a slightly higher level of U.S. industrial consumption in 1964 than the 123-million-ounce Handy and Harman figure used elsewhere in this study.

U.S. coinage demand averaged a little under 40 million ounces annually from 1949 through 1960. Coupled with relative stability in the industrial use of silver during the same years, this meant that total U.S. silver consumption remained relatively constant. For example, U.S. industrial demand plus U.S. coinage demand was 148.8 million ounces in 1953 and 148.0 million ounces in 1960. Subsequently, silver requirements for coinage have grown at a tremendous pace, most recently because of the Treasury's efforts to overcome the shortage of subsidiary coin. Accompanied by a moderate increase in industrial demand, the result has been more than a doubling of overall U.S. consumption of silver in the 4 years since 1960. On the basis of available statistics it appears that U.S. industrial consumption plus coinage use during calendar year 1964 amounted to about 325 million ounces; it was less than 150 million ounces in 1960.

### *Production*

Production of silver in this country has remained remarkably constant during the postwar period—a fact which suggests that there may be no dramatic increases in the offing. During the individual years covered in Table 3, production fluctuated narrowly between 35 and 40 million ounces except for a 1959 decline to 23.0 million caused by a prolonged copper strike. Early indications are that 1964 refinery production of silver may amount to about 36 million ounces. From 1949

TABLE 3.—*U.S. Silver consumption and sources of supply, 1949-64*

{ In millions of fine troy ounces }

	Average, 1949-52	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
Industrial consumption.....	99.9	106.0	86.0	101.4	100.0	95.4	85.5	101.0	102.0	105.5	110.4	110.0	123.0
New production.....	39.2	37.7	35.6	36.5	38.7	38.7	36.8	23.0	36.8	34.9	36.3	35.0	36.0
Difference.....	60.7	68.3	50.4	64.9	61.3	56.7	48.7	78.0	65.2	70.6	74.1	75.0	87.0
Add: U.S. coinage.....	35.0	42.8	53.2	8.2	31.4	52.0	38.2	41.4	46.0	55.9	77.4	111.5	203.0
Equals: Indicated deficit.....	95.7	111.1	103.6	73.1	92.7	108.7	86.9	119.4	111.2	126.5	151.5	186.5	290.0
Accounted for by—													
Net commercial imports.....	-95.4	-92.9	-88.1	-56.5	-68.5	-50.1	-71.2	-55.3	-29.5	-9.1	-63.3	-30.2	+45.0
Lend-lease, returns (-).....				-23.2	-88.8	-89.8	-103.4	-45.0	-15.7	-10.4	-8.3		
Change in Treasury stocks.....	-3.0	-14.9	9.2	-4.8	+51.1	+33.6	+91.9	-46.3	-67.7	-129.5	-94.4	-184.0	-366.3
Total accounted for.....	-98.4	-107.8	-78.9	-84.5	-106.2	-106.3	-82.7	-146.6	-112.9	-149.0	-166.0	-212.5	-321.3
Discrepancy ((-) values imply net additions to domestic inventory).....	-2.7	+3.3	+24.7	-11.4	-13.5	+2.4	+4.2	-27.2	-1.7	-22.5	-14.5	-27.7	-31.3

Source: Consumption, coinage, and production data from *Annual Reports of the Director of the Mint*, except for 1964 when consumption and production are from Handy and Harman's *Annual Review*. Preliminary estimates suggest that U.S. mine production of silver in 1964 was about 37 million ounces. Net commercial imports from Handy and Harman, *Annual Reviews* and *Minerals Yearbooks*. Lend-lease returns from *Annual Reports of the Director of the Mint*. Change in Treasury silver stocks from *Treasury Daily Statements*.



through 1960, approximate constancy in production and relatively stable consumption held the U.S. silver deficit around an average of about 100 million ounces annually, or about 65 million ounces exclusive of coinage demand. However, the deficit has widened with the precipitous increase in the coinage demand for silver and probably totaled more than 290 million ounces during calendar year 1964.

TABLE 4.—*Estimated U.S. Silver Consumption, by Field of Use or End Product, 1959-64*

[In millions of fine troy ounces]

Field of use or end product	1959	1960	1961	1962	1963	1964
Batteries.....	3.5	3.5	5.0	6.0	6.2	9.0
Brazing alloys and solders.....	10.5	10.5	11.0	13.0	13.0	15.8
Dental and medical.....	4.8	4.8	4.9	5.0	5.1	5.2
Electrical contacts and other electrical uses.....	20.5	19.5	24.0	25.0	26.0	30.3
Electronic components.....						
Mirrors.....	3.0	3.0	3.1	3.1	3.1	3.1
Missiles.....				1.0	.2	1.0
Photographic film, plates, and sensitized paper.....	30.8	31.7	32.3	33.3	33.3	40.3
Silverware and jewelry.....	28.0	29.0	25.0	22.0	22.0	22.5
Miscellaneous.....			.2	2.0	1.1	
Net industrial use.....	101.0	102.0	105.5	110.4	110.0	127.1

Source: U.S. Department of Commerce estimates published in the *Congressional Record*, Apr. 23, 1965, p. 8069.

The lower section of Table 3 summarizes briefly the way in which the indicated deficit between U.S. silver consumption and production has been met. An excess of commercial imports over exports, ranging from 50 to 100 million ounces, has typically met a substantial part of industrial needs. The decline of net imports in 1961 reflects higher silver exports and during 1964 there was a net export of silver because of the sharp increase in bullion redemptions, some of which were undoubtedly for foreign account. Lend-lease returns of silver are shown separately in the next line of the table, and the change in Treasury stocks of silver is the last entry for which direct information is available.

A final line in the table shows the discrepancy between the indicated deficit and the amount accounted for by net imports, lend-lease returns, and changes in Treasury stocks. While this discrepancy contains residual errors and Treasury sales of silver to Government agencies, it may also provide a rough measure of changes in domestic inventory. Beginning in 1959 the residuals are consistently nega-

tive in sign which would be the case where there were net domestic accumulation of privately held inventories of silver.

### Analysis of Changes in Treasury Stocks of Silver and a Projected Rate of Depletion

The dominating feature of the world silver situation is the existence of a massive production deficit. As noted earlier, the indicated world deficit in 1963 was about 210 million ounces, 25 million ounces in the Free World outside the United States, and 185 million ounces in this country. During 1964 the overall world deficit widened to 325 to 350 million ounces, chiefly because of a sharp increase in U.S. coinage demand. As Table 3 shows, the indicated U.S. deficit of 185 million ounces in 1963 was almost exactly matched by a decline in the Treasury's stock of silver. In 1964, U.S. silver consumption (both industrial and coinage) exceeded production by about 290 million ounces, and Treasury stocks fell by an even larger amount because of increased redemptions of silver certificates. In 1965, the consumption deficit seems likely to be substantially larger than in 1964.

The past decline in Treasury stocks of silver is detailed in Table 5. A rough indication of the possible rate at which remaining Treasury stocks might be depleted can be obtained by simple extension of the rate of loss in recent years. It is true, of course, that any projection of that nature is limited in its value by uncertainty as to the shape that future developments will take. The single most important future influence in 1965 will be the nature and timing of the Treasury's own legislative recommendations and subsequent developments in Congress. Additional factors are the extent to which the existing coin shortage can be overcome by the much higher levels of coin production now underway, and the point at which declining Treasury stocks of silver would cause a sustained acceleration in the demand for the redemption of silver certificates.

The data of Table 5 for past years have mainly come from Treasury *Daily Statements* and *Circulation Statements*. In the interests of simplicity in presentation, a number of relatively minor influences upon the Treasury silver stock have been grouped into the single category "other causes of change." It should be noted that the total silver stock figure shown in Table 5 includes the four *Daily Statement* categories: "Silver," "Silver dollars," "Subsidiary coin," and "Other silver bullion." This overall figure customarily exceeds the single *Daily Statement* entry for "Silver" by varying amounts which have recently averaged some 30 to 35 million ounces. Working with the larger total allows Table 5 to provide a more coherent picture of the separate influences on the Treasury silver stock.

The three memorandum columns at the extreme right give the amounts of silver certificates outside of the Treasury converted to a



bullion equivalent at 0.7734375 ounces per dollar. It will be noted that by the end of 1964 retirement of silver certificates had reduced the bullion equivalent of those in circulation almost 300 million ounces below the total Treasury silver stock. As long as retirement of silver certificates proceeds at a rate in excess of the decline in the Treasury's silver stock—as it has thus far in 1965—the Treasury's margin of “uncommitted” silver will be widening. No doubt the rate of retirement of silver certificates will fall over time, particularly since a relatively large amount of silver certificates are probably lost or destroyed and will never be presented for redemption or retirement. There would be no point in immobilizing any substantial fraction of Treasury silver as backing for these notes and it might conceivably interfere with an orderly resolution of the coinage problem.

On the basis of the information in Table 5, it appears possible that Treasury stocks of silver might be depleted in 2 to 3 years if present trends continued. The projected rate of use of silver in coinage would probably fall back as the present crash coinage program achieved its aims. On the other hand, it is quite possible that the Treasury would have to supply larger amounts of silver in holding the market price of silver—an absolute essential to protect the existing coinage—as its own stocks neared depletion.

The latter possibility counsels against any delay in beginning the transition to a new coinage system. It is encouraging that redemptions of silver certificates in the early months of this year have been relatively modest in amount, well below the peak levels last year when a dock strike and other factors led to a sharp but temporary increase. This decline in the rate of redemptions has been more or less roughly paralleled by a decline in the futures price of silver which may well signify that market expectations of any increase in the spot price of silver are considerably dampened. However, it is clear that any failure to proceed promptly with the creation of a new subsidiary coinage system reducing the need for silver would encourage speculation and might lead to a rapid depletion of Treasury stocks of silver.

If the Mint were to switch over to the production of nonsilver coinage by the beginning of 1966, Treasury stocks would surely be adequate to stabilize the silver market through sales and/or redemptions during the time that would be needed to produce large amounts of new, non-silver coins.

If the Mint were to switch over to the production of reduced content silver coinage during 1965, it is not self-evident that Treasury stocks would be large enough to hold world silver prices below, say, \$1.29+ during the transition period, let alone for any extended period thereafter. Stocks might conceivably be adequate to negotiate the transition, but a favorable outcome depends upon a number of factors about which little assurance can be felt. Net coinage requirements would

TABLE 5.—*Analysis of Changes in U.S. Treasury Silver Stocks Since 1958*

[In millions of fine troy ounces]

	Silver used in coinage	Bullion exchanged for silver certificates	Old silver dollars paid out	Other <sup>1</sup> causes of change	Total change in silver stocks	Silver stock at end of period <sup>2</sup>	Memorandum: Bullion equivalent of silver certificates <sup>3</sup> at end of period		
							In circulation	Held by Fed- eral Reserve banks and agents	Total
1958-----	-38.2	-----	-12.7	+142.8	+91.9	2,106.2	1,683.5	188.3	1,871.8
1959-----	-41.4	-----	-15.7	+10.8	-46.3	2,059.9	1,651.1	209.3	1,860.4
1960-----	-46.0	-----	-16.2	-5.5	-67.7	1,992.2	1,632.0	215.9	1,847.9
1961-----	-55.9	-----	-23.8	-49.8	-129.5	1,862.7	1,616.3	191.2	1,807.5
1962-----	-77.4	-----	-27.4	+10.4	-94.4	1,768.3	1,536.0	177.5	1,713.5
1963-----	-111.5	-----	-51.5	-2.0	-184.0	1,584.3	1,440.4	105.4	1,545.8
1964:									
January-----	-9.8	-3.5	-1.0	+3.1	-11.2	1,573.1	1,331.8	192.4	1,524.2
February-----	-11.3	-2.2	-2.3	+1.2	-14.6	1,558.5	1,317.4	175.0	1,492.4
March-----	-15.3	-3.9	-16.5	+1.9	-33.8	1,524.7	1,326.4	153.1	1,479.5
April-----	-16.4	-8.0	-----	-8	-25.2	1,499.5	1,314.1	112.5	1,426.6
May-----	-16.2	-3.4	-----	+1.4	-18.2	1,481.3	1,317.6	100.2	1,417.8
June-----	-11.5	-8.2	-----	-11.8	-31.5	1,449.8	1,321.1	80.3	1,401.4
July-----	-11.4	-3.4	-----	+3.0	-11.8	1,438.0	1,271.4	92.7	1,364.1
August-----	-18.9	-5.1	-----	+1	-23.9	1,414.1	1,245.3	100.0	1,345.3
September-----	-20.3	-21.4	-----	+3.7	-38.0	1,376.1	1,205.4	96.4	1,301.8
October-----	-22.3	-44.1	-----	-2.5	-68.9	1,307.2	1,117.5	88.3	1,205.8
November-----	-23.7	-20.5	-----	-1.9	-46.1	1,261.1	1,049.6	66.5	1,116.1
December-----	-26.0	-17.6	-----	+5	-43.1	1,218.0	952.3	82.1	1,034.4
1964-----	-203.0	-141.4	-19.8	-2.1	-366.3	1,218.0	952.3	82.1	1,034.4



1965:										
January	-----	-26.1	-11.2	-----	+ .2	-37.1	1,180.9	866.6	103.3	969.8
February	-----	-22.5	-8.7	-----	+2.6	-28.6	1,152.3	817.0	88.7	905.7
March	-----	-25.3	-7.3	-----	-3.0	-35.6	1,116.7	763.9	68.5	832.4
April	-----	-27.3	-12.4	-----	-.4	-40.1	1,076.6	-----	-----	-----

<sup>1</sup> Includes purchases, lend-lease returns, net sales and transfers to Government agencies, sales to industry during 1959-61, variation in the amount of subsidiary coin and bullion held in the Treasurer's General Account, and a residual discrepancy arising from the fact that coinage and bullion exchanges are shown here on a Mint accounting basis while the total change in silver stocks is shown on the more widely available *Daily Statement* basis.

<sup>2</sup> As shown in the *Daily Statement*. The total includes approximately 64.8 million ounces held by certain agencies of the Federal Government.

<sup>3</sup> Issued after June 30, 1929.

Source: Treasury *Daily Statements*, *Circulation Statements*, and unpublished material.

probably be smaller (private hoarding could outweigh Treasury net recoveries of silver from the existing stock of coinage), but speculative demands for silver would surely be much larger. The market would not expect that the Treasury would, or could, hold silver prices at \$1.29+ beyond a fairly short period of transition, and the volume of Treasury redemptions, or sales to the market, at \$1.29+ could expand rapidly as the market anticipated the imminent appearance of much higher silver prices. Indeed, this psychology could even develop with a transition to base alloy subsidiary coinage if at the same time the silver content of the dollar were reduced since this would raise the monetary value of silver and encourage the belief that the market price would also rise.

The problem of the transition to silver coinage of reduced content is examined more fully in Section V of this study.

### **The Influence of Price on Silver Production and Consumption**

The remainder of this section of the discussion will examine the extent to which an increase in the market price of silver would be likely to bring production and consumption into an early balance. In principle, there should be some increase in the relative price of silver that would help to bring about market equilibrium. Higher prices can be expected to encourage net substitutions and economies in use on the consumption side and also to encourage some increase in silver production beyond that which would otherwise occur. In the context of the present study, the pertinent issues are the size of the increase in price that would be required, and the nature of the adjustments that would take place during a transition to the new equilibrium. Only the first of these issues—the eventual price at which the market might balance—will be discussed at this stage. It must be emphasized that at this stage no attention is to be paid to the feasibility of achieving a successful transition to a new system of reduced content silver coinage.

Actually, the question of how the transition would be achieved is fully as important, indeed much more important from the standpoint of the Treasury and the provision of an adequate supply of coinage, than the eventual price at which the market might settle. Any proposal to reduce the silver content of U.S. coinage would have to allow for the fact that a quicker supply response to rising silver prices would come from existing stocks of silver—including silver coinage in circulation—than from an expansion in new production, which would only occur after some lapse of time. Because an increase of market price much above \$1.38 an ounce would imperil the existing subsidiary coinage, the transitional problems take on unique significance. How, or whether, the transition to silver coinage of reduced silver content could be effected is a complicated issue, better explored separately



from the probable longer-run effects of higher price on the consumption and production of silver.

Consideration of the prices that might eventually be reached in silver markets, after the transitional period during which price would have been stabilized, can, however, throw a good deal of light on the practicability of replacing our present coinage system with one of reduced silver content. Reduction of the silver content of our existing coinage system would increase the ceiling, or ceilings, to which the market price of silver could rise before Treasury sales of silver to the market would again be required. If it appears that the market price of silver might again reach the monetary value of our coinage within a reasonably short period of time, reduction of silver content could not be regarded as an eligible long-run solution, irrespective of whether or not the immediate transition could be safely negotiated.

A limiting consideration is the fact that straight silver-copper alloys with less than 50 percent silver content are not acceptable because of their poor physical characteristics. It will be assumed, pending Section IV's examination of the technical and metallurgical characteristics of alternative coinage alloys, that silver-copper coins of 800, 700, 600, and 500 fineness do meet at least minimum standards of acceptability and are relatively easy to produce. However, lower silver contents can also be achieved by cladding silver on an inner core of copper or lower content silver and by adding some nickel and zinc to otherwise unacceptable silver-copper alloys. These possibilities will be discussed subsequently. For the present, with attention confined to straight silver-copper alloys, the question is whether, after the transition to a coinage system with reduced silver content, silver prices would be at all likely to reach the ceilings listed in Table 6. If analysis of supply and demand factors suggests very strongly that the ceiling associated with a certain silver content could be reached in the foreseeable future, that particular coinage alternative would have to be ruled out as a long-run solution.

TABLE 6.—*Monetary Value of U.S. Coinage of Existing Thickness and Diameter for Various Silver Contents*

Silver content	Monetary value	
	Silver dollar	Subsidiary coins
90 percent.....	\$1. 29+	\$1. 38+
80 percent.....	1. 48+	1. 58+
70 percent.....	1. 71+	1. 83+
60 percent.....	2. 03+	2. 17+
50 percent.....	2. 48+	2. 66+

Source: Bureau of the Mint.

## The Influence of Silver Price Upon Production

An increase in the price of silver which led to an increase in the expected profitability of silver mining would normally be expected to lead to some subsequent increase in production. Higher prices would tend to encourage more exploration, higher production from mines already in operation, reopening of submarginal properties, and the reworking of old mine tailings. The strongest influence of higher silver prices, as such, would be upon the segment of the industry engaged in silver mining proper. In that case, the immediate effect is to increase total revenue per ton of ore in direct proportion to the increase in silver price. Where silver is found in association with other metals, the importance of a silver price increase is modified by the proportion of total revenue attributable to silver. Where only traces of silver are found with other metals, the increase in revenue will obviously not be of much consequence. Between this extreme and that of pure silver mining there is a range of situations in which an increase in silver price will have a greater or lesser effect upon company receipts.

Against the nominal stimulus to production from a higher price must be set the fact that silver mining is not a manufacturing operation. A higher price for silver may be required simply to maintain production at a given level. As marginal mines and deposits are worked out, continuing exploration activity is required even to maintain known reserves at a constant level. This exploration activity can be increasingly expensive in relationship to the market value of the new silver reserves that are discovered. Technological progress in exploration and mining techniques can arrest or even reverse a tendency for the level of reserves and the amount of current production to decline at any given level of silver prices. But, a fairly rapid rate of technological progress may be essential not only to overcome diminishing returns to exploration effort, but also to offset the effects of steady increase in money wages and other costs over time.

Shallow deposits of silver have presumably been well worked over and deep mining is very expensive. Private efforts here and abroad, and the Bureau of Mines shallow drilling program in this country, may discover sizable additional silver deposits near to the surface. The recent find of Texas Gulf Sulphur in the Timmins region of Ontario is impressive. Published reports at the time estimated that 55 million tons of copper, zinc, and silver ore, with an average grade of 4.85 ounces of silver per ton, had been found under an overburden of 20 feet. It would seem unwise to count on finds of this sort occurring frequently, but it does suggest that sizable new finds may occur.

Rising silver prices would exert some effect on the overall profitability of mining operations in which silver occurs in byproduct as-



sociation with other metals. Data are not available to estimate the extent of any stimulus to base-metal mining that would result from a higher price of silver. However, it is well to recognize that the very concept of a byproduct is to some extent a convenient accounting fiction and while higher silver prices may not make "by-products" into "co-products" in very many cases, some overall stimulus to the profitability of base-metal mining and some consequent increase in silver production could be expected to occur. There is no evidence, however, that this stimulus would be very strong.

The main line of causation is not likely to run from higher silver prices to base-metal mining. Instead, a major influence upon levels of silver production in the future, as in the past, will be the amounts of copper, lead, and zinc that are produced, and the proportion of silver in total tonnage. Therefore, estimation of the direct effect of higher silver price upon its production must be supplemented by estimation of the amounts of silver that will be forthcoming as a more or less natural consequence of expansion in base-metal mining.

### World Silver Production

Some major characteristics of world silver production since 1900 are summarized in Chart 1. It will be noticed that there has been a substantial degree of correspondence between short-run fluctuations in the output of copper, lead, and zinc, and the output of silver. Longer-run trends in the production series were similar until the period following World War II. Since 1945 aggregate world output of copper, lead, and zinc has grown rapidly; the output of silver has also increased, but more slowly.

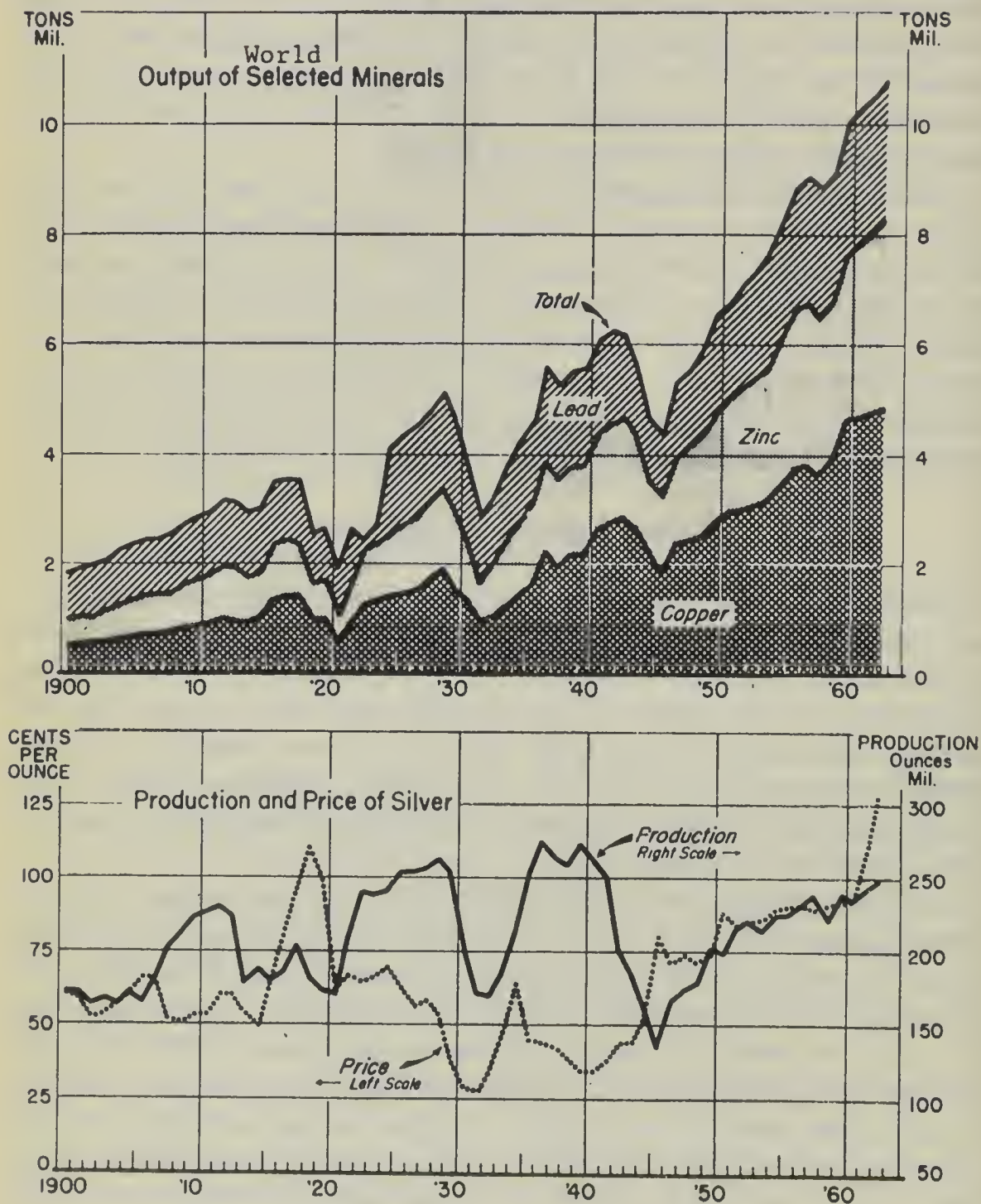
Some of the appearance of synchronous fluctuation in the upper and lower panels of Chart 1 is due to the three interruptions to production caused by World War I, the Great Depression, and World War II. However, there is little doubt that the byproduct relationship also accounts for much of the parallelism in the production movements. Unfortunately, there are no comprehensive historical data available at the world level on the amounts of silver mined as byproduct and mined as pure silver. This obstructs any conclusive statistical evaluation of the separate influence of base-metal production and silver price upon the production of silver. Such evidence as there is suggests that the byproduct relationship has generally been the more important.<sup>1</sup>

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<sup>1</sup> The price and byproduct influences were tested by a multiple correlation of world silver production with silver price and the aggregate output of copper, lead, and zinc during the 1900-1963 period. Erratic influences upon silver production were so strong during the period that the overall correlation is a very poor one, with only about 35 percent of the overall variation in silver production explained by silver prices and base-metals production taken together. Silver prices and production were actually negatively correlated, although base-metal production was, as expected, positively related with silver

Chart 1

## FACTORS AFFECTING SILVER PRODUCTION 1900 to Date



Indeed, the statistical association of silver production and silver price does not appear to have been particularly close or consistent. Until the depression of the 1930's, there is indication of an inverse relationship with production falling when price was rising, and the

production. The relationships are much closer in the postwar period, particularly between silver production and the production of base metals. However, the period of time is short and the correlation between silver prices and base-metals production is relatively high. Under these conditions, the multiple correlation technique does not yield dependable estimates of the independent influence of the explanatory variables, in this case silver price and base-metals production.



reverse. Price and production did fall sharply together during the early depression years and then rose together under the stimulus of the U.S. Silver Purchase Program, and a general revival in base-metal mining. Aside from this cyclical rise and fall, silver price and production seem to have been most closely related in the period following World War II. But, this has also been a period of very rapid growth in base-metal production which would account for the observed increase in silver production. In all likelihood the sustained postwar expansion in copper, lead, and zinc output has, in fact, been the dominant influence on world silver production. The postwar increases in the price of silver may have played some limited part in encouraging the expansion of output, especially in regions where pure silver mining is important. However, it is only recently that the price increases have been sizable and more time is needed to see just how much new production will be forthcoming as a result.

Increases in copper and zinc production in the postwar period have far exceeded the expectations generally held in the early 1950's. It is interesting in this connection to compare the actual increases that have occurred with the projections for 1975 made by the Paley Commission in 1952. Table 7 shows that by 1962 copper production already exceeded the Paley Commission estimate for 1975 by a wide margin. World copper reserves are very large and the Paley estimate for 1975 is quite unlikely to prove to be accurate. Zinc production also gives every indication of rising well above the Paley estimate; the estimate for lead production may be closer to the mark. The apparent failure of these projections, made little more than a decade ago, to anticipate trends in base-metal mining is a sobering reminder of the difficulties involved in any long-range forecast.

There are some general features of the experience since 1900 that do offer guidance as to probable future levels of silver production. Dur-

TABLE 7.—*Comparison of Paley Commission 1975 Estimates of Free World Copper, Lead, and Zinc Production with Actual Production, 1950 and 1962*

[Production in thousands of short tons]

	1950 actual	1962 actual	1975 Paley estimate	Percentage increase	
				1962 over 1950	1975 estimate over 1950
Copper-----	2, 515	4, 145	3, 850	65	53
Lead-----	1, 644	2, 060	2, 700	25	64
Zinc-----	1, 931	3, 010	3, 200	56	68

Source: Report of the President's Materials Policy Commission and Bureau of Mines.

ing the entire period since 1900 the overall trend in silver production has been positive, but not very large. On the basis of the production experience since 1900, the annual average increase in world silver production has been only about 325,000 ounces. Silver production has known extreme variations in the past, and this cautions against the acceptance of any mechanical projection of past production levels as a guide to what could happen in the future.

Conditions in the postwar years are more relevant as an indication of the degree of future expansion in silver output that may be expected. The 325,000 ounce annual production increment, based upon the entire experience since 1900, is far too low as an estimate of future production increases. The aggregate production of copper, lead, and zinc has grown rapidly in the postwar period, and recent increases in the price of silver have offered additional encouragement for the expansion of silver mining. While base-metal production will not necessarily continue to grow so rapidly, increases in silver prices might compensate for some slackening in copper, lead, and zinc production. On the basis of the relatively favorable production experience in the postwar period, an annual average increase in world silver production of about  $3\frac{1}{2}$  million ounces might be expected in the future. In general, this average increase of  $3\frac{1}{2}$  million ounces seems a much better guide to what may be expected in the future than the much lower 325,000 ounce average increase over the entire period, 1900-63.

Even this higher estimate of future production increases may very well be too low. Table 8, dated October 27, 1964, gives estimates of new Free World silver production supplied to the Treasury by Mr. Simon D. Strauss, Vice President, American Smelting and Refining Company, and member of the Silver Committee of the American Mining Congress. These estimates of the new production of silver that may take place in the next 4 years were described as conservative and based upon projects for which financing was already committed. Table 8-A presents estimates made on the same basis but at a somewhat later time by Robert O. Hardy, President, Sunshine Mining Company, and Chairman of the Silver Committee of the American Mining Congress. These estimates of the new production of silver from knowledgeable industry sources should be more accurate, over the timespan to which they refer, than any mechanical projection of past experience. Furthermore, the Strauss and Hardy estimates receive support from the fact of a 7 million ounce increase in Free World silver production during 1963. Preliminary data suggest that a much smaller increase of only some 2 million ounces may have occurred during 1964. The Strauss and Hardy estimates, if they were realized, would mark a fairly significant departure from postwar production experience, but would do very little to close the large gap between Free World consumption and production.



TABLE 8.—*Estimate of New Free World Silver Production Expected in the Next 4 Years*

<i>Location</i>	<i>Ounces of silver</i>
United States:	
Mineral Park.....	168, 000
Battle Mountain.....	432, 000
East Tintic.....	2, 500, 000
Bingham Canyon.....	750, 000
Flat Head.....	1, 000, 000
Wah Chang.....	300, 000
Blue Hill.....	117, 000
Missouri Lead Belt.....	500, 000
Twin Buttes.....	1, 500, 000
Total.....	7, 267, 000
Mexico .....	1, 000, 000
Central and South America.....	1, 000, 000
Europe:	
Consolidated Mogul.....	550, 000
Northgate.....	1, 100, 000
Total.....	1, 650 000
Australia and Southeast Asia:	
Cobar.....	500, 000
Mount Isa.....	5, 800, 000
Marinduque.....	1, 500, 000
Te Aroha.....	70, 000
Total.....	7, 870, 000
Canada:	
Texas Gulf Sulphur.....	7, 750, 000
Granduc .....	750, 000
Brunswick.....	2, 500, 000
Western Copper.....	570, 000
Lake Dufault.....	1, 500, 000
Total .....	13, 070, 000

## SUMMARY

United States.....	7, 267, 000
Mexico .....	1, 000, 000
Central and South America.....	1, 000, 000
Europe.....	1, 650, 000
Australia and Southeast Asia.....	7, 870, 000
Africa.....	( <sup>1</sup> )
Canada.....	13, 070, 000
Total.....	31, 857, 000

<sup>1</sup> No change.

New foreign silver production in the next 4 years would amount to about 25 million ounces according to Table 8, and to about 30 million ounces according to Table 8-A. A net addition of this size to current production would be greater than the gains that have been made in recent years, although not drastically out of line with foreign production increases in the mid-1950's. Between 1949 and the present time, the 4-year moving total of increases in foreign production has been as high as 29 million ounces in 1949-53, and as low as 1.6 million ounces in 1959-62.

TABLE 8-A.—*Estimate of New Free World Silver Production Expected in the Next 4 Years*

<i>Location</i>	<i>Ounces of silver</i>
United States:	
Mineral Park.....	168,000
Battle Mountain.....	432,000
East Tintic.....	2,500,000
Bingham Canyon.....	750,000
Flat Head.....	1,000,000
Wah Chang.....	300,000
Blue Hill.....	117,000
Missouri Lead Belt.....	500,000
Twin Buttes.....	1,500,000
Silver Summitt.....	1,000,000
	<hr/>
Mexico.....	8,267,000
Other America : E. Mochito.....	2,000,000
	<hr/>
Peru :	
Cerro.....	1,500,000
Machicala.....	500,000
Kiowa.....	200,000
Arcata.....	350,000
Quiruvilca.....	250,000
	<hr/>
	2,800,000
	<hr/>
Europe :	
Consolidated Mogul.....	550,000
Northgate.....	1,100,000
Largentiere.....	1,500,000
	<hr/>
	3,150,000
	<hr/>
Australia :	
Cobar.....	500,000
Mount Isa.....	5,800,000
	<hr/>
	6,300,000
	<hr/>



TABLE 8-A.—*Estimate of New Free World Silver Production Expected in the Next 4 Years—Continued*

<i>Location</i>	<i>Ounces of silver</i>
<b>Southeast Asia :</b>	
Marinduque-----	1, 500, 000
Te Aroha-----	70, 000
	<hr/> 1, 570, 000 <hr/>
<b>Canada :</b>	
Texas Gulf Sulphur-----	7, 750, 000
Granduc-----	2, 500, 000
Brunswick-----	750, 000
Western Copper-----	570, 000
Lake Dufault-----	1, 500, 000
Mount Washington-----	200, 000
	<hr/> 13, 270, 000 <hr/>
Grand total (approximate)-----	38, 000, 000

The projected 7- to 8-million-ounce increase in U.S. production during the next 4 years may be slightly more difficult to achieve. No sustained increase of this magnitude has occurred in U.S. production during the postwar period. However, there is reason to believe that some increase in U.S. silver production will occur within the near future, possibly on the scale envisaged in the Strauss-Hardy projections. A study of the silver situation prepared last year in the Department of the Interior projected an increase in U.S. silver production of about 1 million ounces per year, reaching a level of 41 million ounces by 1970. While somewhat below the increases suggested by Strauss and Hardy, the Interior estimate is essentially consistent with them in anticipating some increase above the plateau upon which U.S. silver production has remained for more than a decade. On the other hand, the Interior study projects only an 18-million-ounce increase in world production by 1968, about half the amount anticipated by the American Mining Congress.<sup>1</sup>

### U.S. Silver Production

Needed increases in silver production will undoubtedly have to come very largely from outside of the United States. Table 9 summarizes the world distribution of silver production in the postwar period. U.S. production of about 60 million ounces in the period immediately following World War I was some 30 percent of world production. The U.S. proportion of world output had fallen below 25 percent after World War II and it has fallen further to less than 20 percent at the present time. Separate discussion of the U.S. industry could hardly

<sup>1</sup> It is understood that the Interior study will be published as Information Circular 8257.

be justified on the basis of its importance in the world supply picture. However, there are much fuller and more dependable statistics available on U.S. production than there are on most foreign sources of production. These statistics throw some light on the respective importance of the price of silver and the output of the metals with which silver is found.

TABLE 9.—*Free World Production of Silver by Countries, 1948-52, 1953-57, and 1962*

Country	Average production, 1948-52		Average production, 1953-57		Production, 1962	
	In thousands of fine troy ounces	Percent of Free World total	In thousands of fine troy ounces	Percent of Free World total	In thousands of fine troy ounces	Percent of Free World total
Australia.....	10, 560	6. 4	14, 222	7. 6	17, 250	8. 5
Bolivia <sup>1</sup> .....	6, 996	4. 2	5, 987	3. 2	3, 760	1. 8
Canada.....	21, 064	12. 7	28, 931	15. 4	30, 669	15. 1
Mexico.....	50, 053	30. 2	45, 191	24. 0	41, 249	20. 3
Peru.....	13, 322	8. 0	22, 164	11. 8	36, 017	17. 7
United States.....	39, 246	23. 6	37, 450	19. 9	36, 345	17. 9
All other.....	24, 715	14. 9	34, 223	18. 2	37, 815	18. 6
Total, Free World....	165, 956	100. 0	188, 168	100. 0	203, 105	100. 0

<sup>1</sup> Exports.

Source: *Annual Reports of the Director of the Mint.*

The basic data are presented in Table 10. The variations in pure silver production of column 2 do not seem to bear any simple relationship with the silver prices of column 4. Practically all of U.S. pure silver production is located in the Coeur d'Alene region of Idaho and most of it in one mine—the Sunshine. Changes in production sometimes have been due to special reasons not directly connected with the price of silver. For example, there were fairly lengthy interruptions of production at the Sunshine Mine because of labor disputes in 1962 and 1963. These could have prevented the appearance of production increases encouraged by higher silver prices. An even more basic limitation of the price and output data of Table 10, as guides to the price-sensitivity of silver production, is the fact that silver prices had been approximately constant for a decade, until they began their sharp increase late in 1961. Some time may have to elapse before the effect of rising prices is fully registered in production increases.

Average gross hourly earnings in metal mining rose by about 100 percent between 1947 and 1961, while the price of silver rose by only 30 percent. Productivity in silver mining can hardly have risen rapidly enough to prevent a continuing squeeze on profit margins.



TABLE 10.—*United States Silver Production by Type of Ore and the Price of Refined Silver in New York, 1947-63*

Year	Total silver production (million fine troy ounces)	Silver ore and placers (million fine troy ounces)	Silver found in association with base metals (million fine troy ounces)	Silver price (cents per ounce)
1947-----	38.6	10.0	28.6	71.82
1948-----	39.2	10.5	28.7	74.36
1949-----	34.9	8.3	26.6	71.93
1950-----	42.3	14.0	28.3	74.17
1951-----	39.9	12.8	27.1	89.37
1952-----	39.8	12.5	27.3	84.94
1953-----	37.7	11.1	26.6	85.19
1954-----	35.6	14.1	21.5	85.25
1955-----	36.5	11.1	25.4	89.10
1956-----	38.7	11.3	27.4	90.83
1957-----	38.7	12.5	26.2	90.82
1958-----	36.8	15.1	21.7	89.04
1959-----	23.0	10.3	13.0	91.20
1960-----	36.8	13.8	23.0	91.37
1961-----	34.9	13.7	21.2	92.45
1962-----	36.3	11.9	24.4	108.37
1963-----	35.2	11.7	23.5	127.91

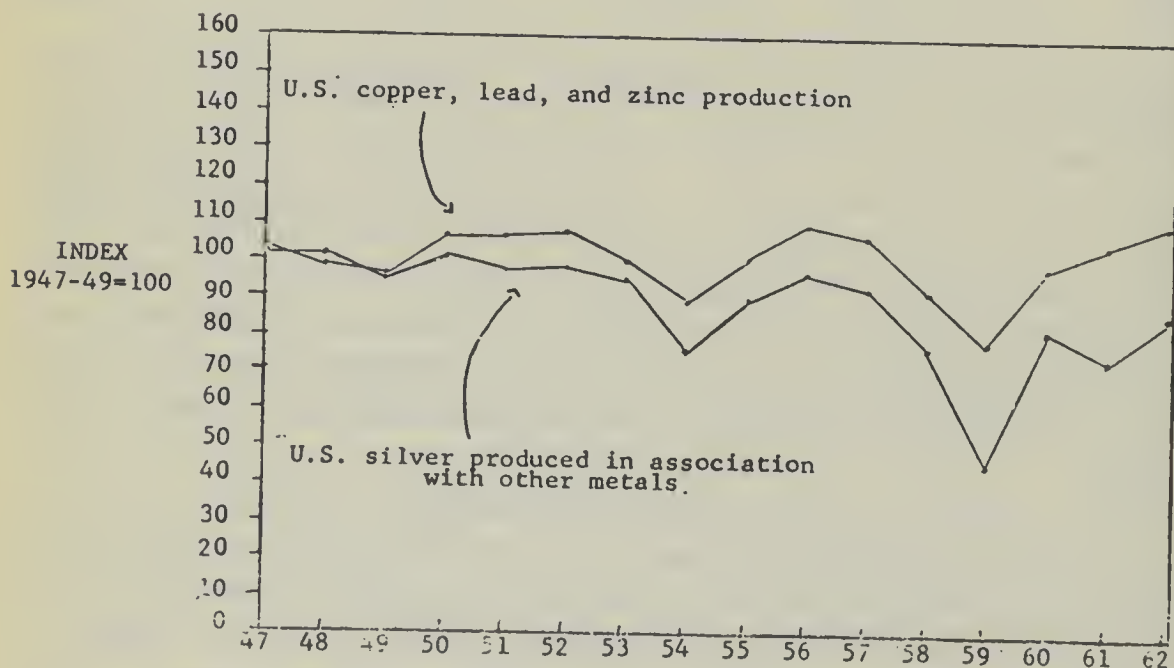
Whether or not a widening of profit margins could achieve much of an expansion in pure silver production is uncertain, but the possibility cannot be entirely disregarded. Higher silver prices in the mid-1930's were followed by sharp expansion in U.S. silver production from precious metal ores, although the paralleling increase in the price of gold at that time was also an important influence. In any case, the absolute magnitude of any future U.S. production increases from pure silver mining could not be very great relative to total requirements.

While the data of Table 10 do not reveal much evidence of the influence of price upon silver production, there is clear evidence of the importance of the byproduct character of most silver production. An index of the silver found in association with other metals, computed from column 3 of Table 10, is plotted in Chart 2 along with an index of the aggregate U.S. output of copper, lead, and zinc. These series fluctuate together very closely because of the conditions of joint supply under which about two-thirds of U.S. silver output is produced. In addition to the close fluctuation of the two indexes, it is interesting to note the overall decline in silver output relative to copper, lead, and zinc output. A falling ratio of silver per ton of base-metal production means that increases in silver price may be necessary simply to keep silver's contribution to \$1 of total revenue at a constant level. Under such circumstances it does not seem at all likely that moderate in-

creases in silver price would give any net stimulus to base-metal mining.

If this observed decline in the amount of silver found with base metals should continue, the effect on overall silver output could be sizable. It is quite conceivable that silver production could fall in absolute terms even though silver prices were rising, if the yield of silver per ton of base ores were to decline at all rapidly. Statistics for silver mining outside of the United States are inadequate to determine whether or not there is a worldwide trend toward lower silver yield in byproduct situations. Scattered evidence and geological considerations suggest to some observers that there may be such a trend. If there is, and if it should become pronounced, the outlook for any continued expansion of world silver production would be much less certain. Major dependence would then have to be placed upon the effect that higher prices could exert on pure silver mining, an effect for which there really is not much direct evidence at all.

Chart 2 Indexes of Copper, Lead and Zinc Production and Silver Produced in Association With Other Metals, 1947-1962



### The Influence of Silver Price Upon Consumption

Discussion of the probable influence of silver prices upon noncoinage demand can be quite brief. Statistical information that bears directly upon the issue is very limited in its range and coverage. The available statistics can be supplemented to some extent by descriptive material on new uses for silver, the extent to which rising silver prices are said to encourage economy in the use of silver, etc. While of some value, this descriptive material is not overly enlightening as to the actual effect that rising prices would exert upon consumption.



The chief influences upon silver consumption in the postwar period appear to have been (a) growth in the use of silver as a consequence of rising consumer income, (b) changes in the industrial consumption of silver as a consequence of new uses, and (c) the dampening effect upon the growth of demand exerted by increases in the relative price of silver. U.S. silver consumption, aside from coinage demand, has really shown only very moderate overall growth during the postwar period, although a very large increase in consumption did apparently take place during 1964.

The statistics on U.S. silver consumption presented earlier in this section pointed to considerable expansion in relatively newer uses, such as batteries and electronic and electrical components, but this expansion has been just about matched by decreasing uses in silverware and jewelry, while photographic uses have been relatively constant. The consumption statistics suggest that the declines in the more traditional uses of silver began before the increase in silver prices during 1961, but price increases undoubtedly intensified these reductions in consumption. In the 3 years, 1961-63, overall consumption of silver in this country for noncoinage purposes remained relatively constant, before increasing by about 12 percent in 1964.

Foreign consumption of silver experienced a very rapid growth phase in the postwar period until 1961. Between 1953 and 1961, the industrial use of silver outside of the United States approximately doubled. Most of this increase in consumption is undoubtedly attributable to rapid increases in income in Western Europe and Japan. Foreign consumption of silver showed a tendency to level off in 1961, just as it did in this country. Subsequent upward revisions in the data on foreign consumption now credit 1962 and 1963 with small increases, but much below the earlier rate of growth and the increase that took place during 1964. It seems reasonable to believe that rising prices for silver have exerted some influence in dampening foreign demand. From 1953 to 1961, the increase in average monthly silver prices in London was a little less than 8 percent over all. Practically all of this increase occurred in 1955, and from 1955 through most of 1961, the London price of silver was almost constant. Therefore, the marked postwar expansion in foreign consumption occurred at approximately constant prices. In 1964, when silver prices leveled off, foreign industrial consumption of silver rose by about 15 percent.

The relative constancy in consumption of silver in 1962 and 1963 very probably was the resultant of opposing forces: the continued growth in income and output that would encourage more use of silver, and the higher price of silver that would encourage less. It is uncertain whether or not further price increases, similar in magnitude to those since 1961, would continue to offset the rapid growth in consumption that would otherwise occur because of rising incomes and

new uses. However, the assumption of slow growth in consumption of silver in physical terms as a consequence of trend growth in income and rising relative prices of silver does find some support in recent experience.

### Prospective Levels of Silver Price in a Free Market

This concluding section considers the danger that within a few decades the market price of silver might reach the higher monetary values associated with various hypothetical reductions in the silver content of the existing coinage. Major reliance is placed upon an examination of the degree to which a given level of higher prices for silver would be successful in removing the excess demand that prevails at the current price of \$1.29+, and in keeping silver markets in balance thereafter. This examination of silver supply and demand draws upon the earlier analysis of the factors that influence silver production and consumption. It does not lead to absolutely definite conclusions and there may also be some value in a more direct approach. Therefore, initial consideration will be given to what a direct extension of the postwar trend in the price of silver would imply for coinage alternatives.

Monthly average New York silver prices are plotted in Chart 3 from 1915 through 1964. The monetary values of U.S. coinage of the existing thickness and diameter for 800, 700, 600, and 500 fineness, taken from Table 6, have also been drawn on the chart. It appears from inspection that if silver prices were to continue something like their postwar increase, which really can be said to date from the depression low of 25¢ silver, a level of \$2 an ounce could very easily be reached within the next two decades.

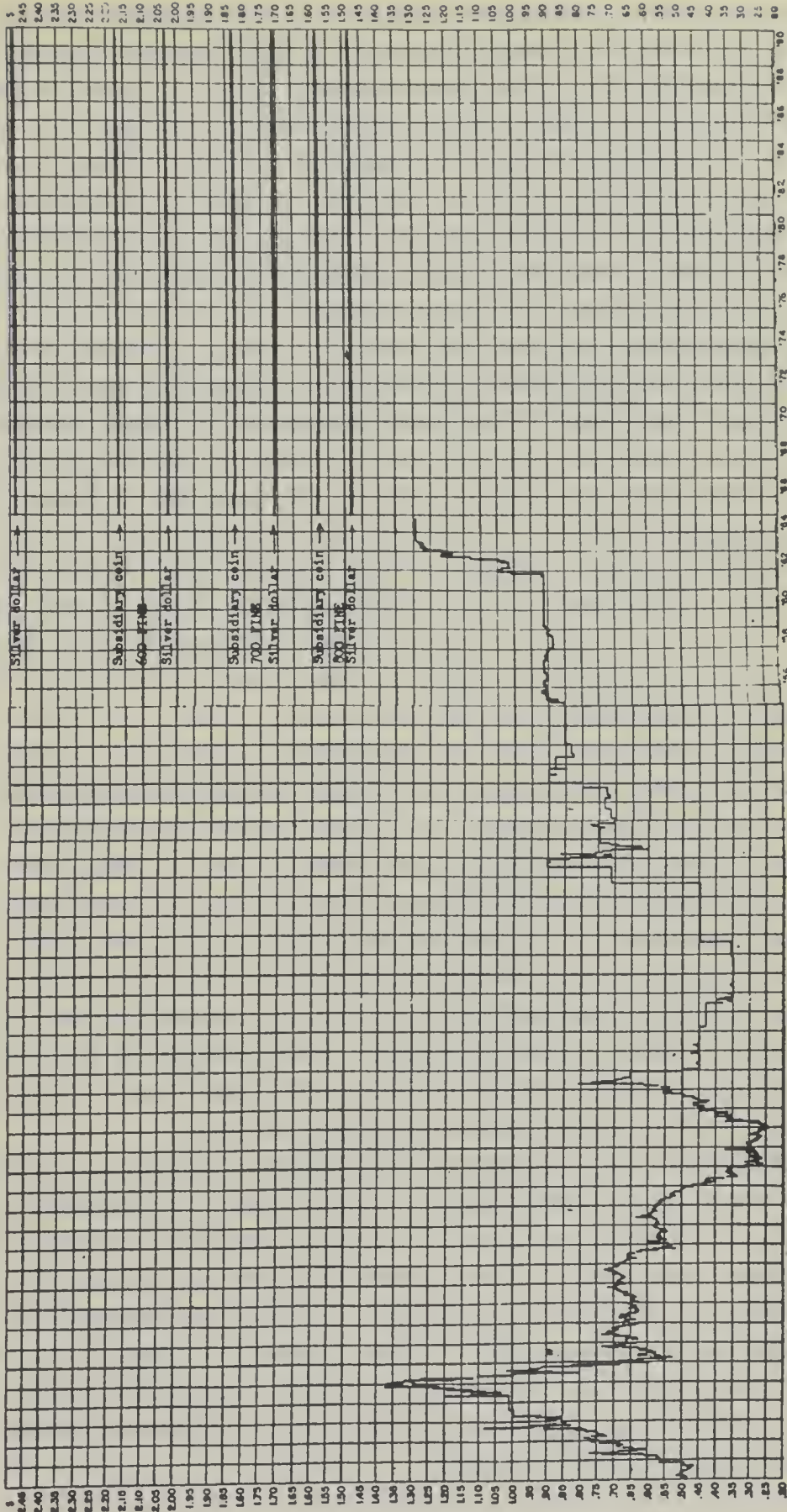
The general level of world costs and prices has moved upwards during much of the postwar period, and it could be argued that continuation of an upward movement of similar proportions is less likely in the future. If so, one factor that has contributed to postwar increases in the price of silver will be lessened in influence. On the other hand, there may be reason to believe that future supplies of silver will be available at increasing real cost because of the steady depletion of known resources and the accompanying need to intensify expensive exploration effort. In such a case, silver prices would be expected to rise relative to a general index of commodity prices. A judgment on this latter score is difficult enough; the byproduct nature of two-thirds of silver production complicates it further.

Extension of past price trends is obviously a very crude forecasting technique. For that matter, the accurate forecasting of a commodity price two decades in the future by any technique whatsoever is not within the realm of possibility. In the present case, however, the question is not so much the single most probable value for the price of



Chart 3: Average Monthly Silver Prices in New York 1915-1964, and the Monetary Values Associated with Various Hypothetical Reductions in the Silver Content of the U.S. Coinage

Subsidiary coin →  
500 FINE



Source: Silver price from Handy and Harman; Monetary Values computed by the Bureau of the Mint.

silver in, say, 1985, as whether there is reason to believe that by that time the price of silver could have reached the various monetary values drawn in on Chart 3. The postwar trend of the price of silver does suggest that an increase to \$2 an ounce, within the next two decades or so, is far from impossible. Unless the analysis of supply and demand can point decisively to factors that promise to hold the price of silver well below its postwar trend rate of increase, it would seem that 800, 700, and even 600 silver content should definitely be ruled out as longrun solutions to the coinage problem.

The alternative to direct projection of the apparent trend in the price of silver is a consideration of the factors bearing upon the supply and demand for silver. The more important of these factors have already been discussed and it is only necessary now to pull together earlier conclusions and apply them to the question at hand. There would, in general, seem to be three major determinants of the extent to which silver prices would rise in a free market. The first is the initial size of the excess demand that will exist at the market price of \$1.29+ when prices are permitted to rise. Excess demand will continue to exert upward pressure on price until it is eliminated by adjustments in consumption and production. The second determinant of the price rise that would be required to bring silver markets into balance is the net effect over time upon silver production of rising silver prices and trend growth in the production of metals with which silver is found. The third determinant is the net effect over time upon silver consumption of higher silver prices and trend growth in consumer income and the industrial output in which silver is used. An omitted factor of some consequence on the supply side is the supplement to current production that would be forthcoming at various price levels from existing stocks of silver. This omission is probably less serious where longrun trends in prices are at issue, than it would be if the intent were to forecast prices a few years ahead.

In holding the free market price of silver at \$1.29+ an ounce the Treasury acts as residual supplier to the world silver market. Consequently, the amounts that the Treasury is obliged to supply to the market are one measure of the excess demand—speculative and non-speculative—in the market at \$1.29+. Since the Treasury has only been holding the line at \$1.29+ for a relatively short time and because of the presence of transitory speculative demands, it is questionable how accurate an indication of the behavior of excess demand over time one can gain from this source.

An alternative approach is to subtract U.S. coinage demand from the Free World production deficits presented earlier in this section. The results are shown in Table 11. They suggest a “normal” annual deficit from 1949 to 1958 of about 25 to 35 million ounces, met from a range of sources other than current production. The price of silver



was approximately constant during this period. During 1959 and 1960 the residual world deficit increased about 40 million ounces above the earlier level. In 1961 there was a further increase of about 40 million ounces, some of which may have represented speculative demand in anticipation of the halting of Treasury sales of free silver. While deficits decreased somewhat in 1962 and 1963 as the price of silver rose to \$1.29+, they remained well above pre-1959 levels. In 1964, the deficit increased by about 40 million ounces. As in 1961, this probably reflected some inventory accumulation in anticipation of an increase in the price of silver. This suggests that aside from speculative demands, which could be expected to carry Treasury redemptions to much higher levels, there may now be excess demand of a "permanent" sort amounting to perhaps 75 million ounces at the current price of silver.

TABLE 11.—*Free World Silver Production Deficit, U.S. Coinage Demand, and the Residual Deficit, 1949-64*

[In millions of fine troy ounces]

	Indicated production deficit	U.S. coinage demand	Residual deficit
1949-53 average-----	-63.9	36.5	-27.4
1953-57 average-----	-72.6	37.5	-35.1
1958-----	-64.2	38.2	-26.0
1959-----	-110.9	41.4	-69.5
1960-----	-121.6	46.0	-75.6
1961-----	-173.6	55.9	-117.7
1962-----	-168.5	77.4	-91.1
1963-----	-205.4	111.5	-93.9
1964-----	-334.9	203.0	-131.9

Source: Table 1.

What size this underlying deficit would be after a transition to coinage of reduced silver content is conjectural. Resumption of anything like earlier rates of growth in foreign consumption of silver—and the apparent increase in 1964 was very large—could easily cause annual excess demand to increase to 100 million ounces or more in a few years. However, the more conservative course may be simply to estimate the market gap at 75 million ounces.

How readily could this 75 million ounce gap be closed from the production side? The postwar trend increase in silver production is only 3½ million ounces a year; its continuation would do practically nothing to close the gap and dampen the upward movement of price. The Strauss-Hardy estimate of an 8 to 10 million ounce annual net increment to world silver production includes whatever may have been the stimulating effect of the increase of more than 40 percent in silver

prices between late 1961 and 1963 and the generally improved outlook for primary metal output at the present time. That production estimate may prove to be an accurate one, but it is far from clear to what extent a higher price of silver accounts for the increase, or how long one could count on sustained increases in silver production of this size.

It is even less clear to what extent, if any, excess demand could also be closed from the consumption side. The statistical information is meager and firm conclusions are very difficult to reach. There is no doubt that, other things being equal, steadily rising silver prices would reduce the volume of silver consumed. But world incomes will be rising and the potential for new uses of silver is said to be considerable. If the consumption of silver were to remain approximately constant because of rapidly rising silver prices while production grew at something like 8 million ounces annually, excess demand would be narrowed in time, but the potential rise in the price of silver would be very great. Indeed, so long as *any* excess demand were chronic, silver prices would be likely to rise, although not necessarily at a steady pace because of the intermittent appearance in the market of silver drawn from existing stocks.

The price of silver rose more than 40 percent in 2 years between late 1961 and 1963 and was only stopped by the U.S. Treasury redemption ceiling. Excess demand seems to have been about 70 million ounces, and this gap was only slightly reduced, if at all, by the increase in price. There are now some signs of a lagged response of production. Consumption growth was slowed a little, but only temporarily. It is extremely doubtful whether recent experience offers any assurance whatsoever that silver prices would remain below \$2 in the next two decades. Indeed, it is not at all difficult to contemplate price rising much farther. It is very hard to rule out the possibility of a doubling or even a tripling in the price of silver unless it can be shown that a higher price of silver would cut back the consumption of silver appreciably from present levels. A basic difficulty is that the silver supply-demand situation has been changing very rapidly in the last half dozen years, so rapidly that little basis exists upon which to estimate with much assurance the independent effect of silver prices upon consumption.

In the last analysis, it is the uncertainty as to how high silver prices might rise within two decades that argues most strongly against reducing the silver content of the coinage as a longrun solution to the coinage problem. That uncertainty could certainly be held to rule out 500 fineness as well as the higher silver contents. This is a question of judgment. No one can be sure that the price of silver would not double in the next two decades and reach the melting point of 500 fine silver coinage. This does seem somewhat less likely than the possi-



bility that price would reach or exceed \$2. Longrun supply and demand factors are not the only reason why silver coinage of 500 or lesser fineness may be unsuitable as a longrun solution. On the basis of longrun market factors alone, silver coinage of 500 fineness is not absolutely ruled out, although the case for it is seriously weakened even without reference to the difficulties of the transition period. Its advantages and disadvantages from a technical and a metallurgical point of view will be considered subsequently along with those of a range of other possible alloys.

All of the discussion to this point has assumed that U.S. coinage demand could be met in the foreseeable future from official stocks of silver remaining at the end of a transition period, possibly supplemented by recovery of old coin. The validity of such an assumption is highly questionable. In the course of its investigation, Battelle made detailed projections of the rates at which Treasury silver would be exhausted on various assumptions as to silver content and coinage requirements. With 50 percent silver content, Battelle predicted that Treasury silver would be entirely exhausted somewhere between 1969 and 1975, if not before. If it were to prove necessary for the Treasury to add its own demand to that of the market, there can be little doubt that the price of silver would rise well above \$2 during the next two decades. Indeed, once Treasury stocks were exhausted, the prospect of keeping any silver coinage in circulation would not be at all bright.

### Conclusion

1. Recent years have seen the development of an enormous gap between Free World production and consumption of silver. The overall deficit, inclusive of coinage demands, was over 200 million ounces in 1963 and almost 340 million ounces in 1964. Even if all coinage demands, U.S. and foreign, are subtracted, a deficit remains although relatively modest in size.

2. U.S. Treasury stocks of silver declined to 1,218 million ounces by the end of 1964 and will decline further to 1,000 million ounces or less by mid-1965. Legislative action on a new coinage system is essential while Treasury stocks of silver are still large.

3. On the basis of past experience, higher silver prices and increases in base-metal production promise to increase world silver production. The independent influence of higher silver prices cannot be estimated with any precision, but there is no reason to doubt that substantially higher prices would lead to some expansion in silver output. Unfortunately, the current production deficit is so large that it cannot be closed from the production side.

4. During the last 15 years, most of the growth in the industrial consumption of silver has occurred in foreign countries; U.S. consumption has grown more slowly. There were some signs that the recent

increase in silver prices had checked the overall growth in world industrial use of silver, but only temporarily, and 1964 found silver consumption increasing sharply both here and abroad.

5. A simple extension of the postwar trend of silver prices suggests that \$2 an ounce might easily be reached by 1980 or 1985. Analysis of supply and demand factors does not yield any precise estimate of the level that silver prices might reach in a free market. The analysis does suggest that there is a very appreciable risk that price could reach \$2 an ounce then, or even much sooner. Battelle's detailed quantitative projections of the rate of exhaustion of Treasury stocks lead to an even more pessimistic appraisal since with 50 percent silver content they can foresee the complete exhaustion of Treasury silver as early as 1969.

6. In view of these considerations, it does not appear that reduction of silver content to 800, 700, or 600 fineness would constitute a longrun (20- to 25-year) solution to the coinage problem. On the basis of longrun supply and demand factors, silver coinage of 500 fineness is, perhaps, not definitely ruled out, although there certainly is substantial risk that a rising market price of silver would soon imperil coinage of 500 fineness. That risk would be overwhelming even for lower silver contents if future U.S. coinage demand could not be met exclusively from Treasury silver holdings.



#### IV. Metallurgical and Technical Characteristics of Alternative Coinage Alloys

This section of the discussion is concerned with the metallurgical and technical characteristics of the various coinage alloys that might replace silver of 900 fineness in a new coinage system. The objective is to narrow the field of possible coinage alloys to those which are acceptable from a metallurgical and technical standpoint. It will then be possible to deal more effectively with problems of the transition to a new coinage system.

The analysis of the preceding section has led to the elimination of silver alloys of more than 500 fineness because of the prohibitive risk that the market price of silver would reach, or exceed, \$2 an ounce within the next 20 years or so. The metallurgical and technical characteristics of silver alloys of 500 fineness remain to be considered along with those of a fairly wide range of base alloys. In addition, there are possibilities in the form of composite coinage materials with silver or base alloy outer layers clad on an inner core. These will be discussed in the course of the present section. Intensive analysis of the technical and metallurgical characteristics of these clad materials will be found in the Battelle study, and the Mint has, itself, been conducting an exhaustive investigation of the feasibility of the use of clad material in U.S. coins.

The alternative alloys are taken up in alphabetical order and any material that has been seriously proposed to, or by, the Treasury receives at least brief consideration in the course of the discussion. In the interest of brevity, attention is chiefly concentrated upon those alloys that seem to show promise. Except in the case of few materials which are readily eliminated because of some glaring deficiency, each coinage alloy is considered under five general headings. These are: Public acceptability, operation in vending machines, counterfeiting potential (including the use of blanks and foreign coins in vending machines), ease and certainty of production, and cost and availability of raw materials. Results of the discussion under these headings are summarized in Tables 1 and 2, at the end of this section, which show acceptable and rejected coinage alloys separately.

## Aluminum

### Public Acceptability

Aluminum coins are unlikely to be acceptable to the public. Pure aluminum is very light in weight with a density of 2.7 grams per cubic centimeter, in contrast to a density of 10.3 for 900 fine silver. Aluminum is also very soft. It could be hardened by the addition of manganese but its wearing qualities would still be relatively poor. Aluminum can be processed so as to produce different colored coins but this seems unlikely to increase its chances for public acceptance. Foreign coinage use of aluminum is chiefly limited to low denominations. There are some examples of use by developed industrial countries; namely, Austria, Italy, and Japan. On balance, it would seem that aluminum would be rated very low in acceptability by the public if proposed as the basic alloy in a new coinage system. It is conceivable that an aluminum 1-cent piece would be acceptable to the public, but its use in high denominations lacks precedent elsewhere and probably would encounter strong public opposition.

### Operation in Vending Machines

Pure aluminum has an electrical resistivity of about 2.7 microhms-cm. This is close to the 2.1 resistivity of 900 fine silver and the 3.1 of the present 1-cent piece. However, current vending machines depend not only upon coins being nonmagnetic, of proper size, and of appropriate electrical resistivity; they also depend upon coins being of a certain minimum weight in order to roll properly and they use a bounce test for hardness.<sup>1</sup> Aluminum coins fall below minimum weight requirements and existing vending machine rejectors cannot easily be redesigned to handle lightweight coins. Furthermore, if manganese were added in order to harden aluminum coins, their electrical resistivity would be raised well above that of the present 1-, 10-, 25-, and 50-cent pieces. Undoubtedly, some rejection apparatus could eventually be designed to take aluminum coins and reject other alloys. No such apparatus is available now and no one is known to be working on the problem.

### Counterfeiting Potential

Unless aluminum coins were to receive some special processing, the potential for counterfeiting would seem to be very great. Sheet aluminum is readily available and the manufacture of coin blanks would not be difficult at all. The metal is soft and would take impressions readily from counterfeit dies. If the dies were of high quality, the minting of aluminum counterfeits might become a problem of some proportions.

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<sup>1</sup> The best single parameter in this connection is probably the product of an alloy's electrical resistivity and its density. Throughout most of the ensuing discussion that deals with vending machine operation, attention is confined to electrical resistivity because the densities of eligible coinage alloys do not vary widely.



Aside from the threat of direct counterfeiting, aluminum blanks would probably pose a real problem for the vending machine industry. Rejectors might eventually have to be equipped with some sensing device by which blanks could be told from coins. This would undoubtedly prove to be difficult and expensive.

### **Ease and Certainty of Production**

Aluminum is a very easy material to work and over the long run it probably would not present any difficult minting problems. The Mint has had no production experience working with aluminum, but experimentally it has been established that present techniques could be adapted readily to the fabrication of any material as soft as aluminum.

### **Cost and Availability of Raw Materials**

Aluminum is cheap with a domestic market price of 24½ cents per pound for unalloyed primary aluminum ingot. Mint requirements would be tiny in proportion to U.S. annual consumption of aluminum of some 3 million short tons.

Conclusion: Rejected as possible coinage alloy.

Reasons: Lack of public acceptability, vending machine, and counterfeiting problems.

## **Columbium**

### **Public Acceptability**

Columbium has been proposed as a coinage material in the 50-cent piece and as a cladding material. The density of columbium is 8.57, just a little less than copper (8.96) and nickel (8.90). The color is gray, the ring is about the same as with silver, and the material is tarnish resistant. Wearing qualities should be appreciably better than those of silver coins. Public acceptability, as with any "exotic" material, is somewhat uncertain.

### **Operation in Vending Machines**

Very little work has been done on the adaptation of vending machine rejectors that would be required with a pure columbium coin, or a columbium alloy. In theory, there would not appear to be any insuperable difficulties but practical experience is lacking. Columbium is fairly heavy and it is nonmagnetic. Its electrical resistivity is in the range of 12.5 to 16.0 microhms-cm, depending upon temperature. This compares with an average resistivity of 2.1 for 900 fine silver and 32.0 for cupronickel (the alloy in the 5-cent piece).

There have been experiments with powder metallurgy techniques in an effort to develop a columbium alloy which would work in existing vending machine rejectors without any alteration being required. However, at the time of writing, these efforts had not progressed much

beyond the experimental stage and had not achieved the required degree of success under operating conditions.

### **Counterfeiting Potential**

Columbium coins would be very difficult to imitate with any material of relatively low value.

### **Ease and Certainty of Production**

The melting point of columbium is exceptionally high—4,474° F. to silver's 1,760° F. Columbium strip would have to be purchased from suppliers, or the Mint would have to acquire new equipment. It is said to be a very ductile material which does not work-harden when cold fabricated. The Mint should be able to make coins from purchased strip of columbium, although costs of fabrication would be somewhat greater.

### **Cost and Availability of Raw Materials**

While fairly acceptable from other points of view, the cost of columbium is prohibitive. A price of \$20 to \$35 an avoirdupois pound was initially mentioned to the Treasury but a price range of \$36 to \$50 is quoted in the *American Metal Market*. Even the \$20 to \$35 price is well above a current price of \$18.81 for silver. It is conceivable that on a large guaranteed coinage demand unit costs might be reduced to, or below, \$10 a pound. This would still be a very expensive coinage material.

There has been no U.S. mine production of columbium ore in recent years. About 60 percent of U.S. imports of columbium concentrate are from Canada; the rest are rather widely dispersed. Domestic stocks of concentrate and ingot are fairly sizable relative to demand for the metal but it is estimated by Battelle that it would take 2 to 3 years to expand production appreciably. Furthermore, coinage requirements would apparently be very large relative to current consumption of the metal and large relative to the national (strategic) stockpile.

Conclusion: Rejected as possible coinage alloy.

Reasons: High cost and uncertain supply outlook. Not accepted in present vending machines. Mint cannot fabricate with existing equipment.

## **75 Copper-25 Nickel (Cupronickel)**

### **Public Acceptability**

Cupronickel is the alloy presently used in the U.S. 5-cent piece and the most widely used coinage material in the world. The weight is good with a density of about 8.6 in contrast to a density of 10.3 for 900 fine silver, and about 9.6 for 500 fine silver. A cupronickel 25-cent piece would weigh 5.37 grams in contrast to 5.83 grams for 500 fine



silver, and 6.25 grams for the present 900 fine 25-cent piece. The color is very good. Cupronickel does lack the luster of coin silver when the silver is untarnished. Also, its ring is not quite so impressive as that of the existing silver coins. However, a cupronickel coin ages well and its physical wear characteristics are very good—appreciably better than those of silver.

Cupronickel coinage has been used for relatively high denomination coins in the United Kingdom and has circulated side by side with silver coinage. Some objection to the use of cupronickel here would be lodged by individuals and groups who, for one reason or another, favor coinage with high intrinsic value. However, this sort of objection would be encountered if any base alloy were proposed for use in the 10-, 25-, and 50-cent pieces. It should be countered by insistence that under modern conditions high intrinsic value in subsidiary coinage tends to interfere with, rather than facilitate, performance of the essential medium of exchange function.

A question arises as to the role of the present 5-cent piece in a cupronickel system. Continuation of the 5- and 10-cent pieces in their present size and diameter, which probably is desirable, would lead to the anomaly of a 5-cent piece larger than the 10-cent piece, but made from exactly the same material. Opinions will differ as to whether this is important, but it is possible that some other material should be used for the 5-cent piece if cupronickel were to be used in the subsidiary denominations.

### Operation in Vending Machines

Cupronickel has a resistivity of 32.0 microhms-cm., which is well above the 2.1 resistivity of 900 fine silver. Because existing rejectors are constructed to accept cupronickel 5-cent pieces, no unusually difficult problems are encountered in making a rejector that will accept cupronickel subsidiary coinage along with silver subsidiary coinage. The National Rejector Company has built a prototype which accepts cupronickel and silver 10-, 25-, and 50-cent pieces—NRCO 8000 Series Model X. The estimated factory cost of this new rejector, not currently in production, is \$20. There are now about 4.5 million NRCO rejectors in service of three different series—4900, 5800, and 8000 regular. Many of these could be modified, at the factory or at a branch service facility, to accept existing silver coins and a new cupronickel system at an estimated cost of perhaps \$10 each.

It has been estimated by the rejector industry representative that the required changeover could be accomplished within 2 years. Possibly it could be made even more rapidly at some increase in expense.

The rejector industry has concentrated upon designing a mechanism that would accept cupronickel 5-, 10-, and 25-cent pieces. A rejector such as NRCO's Model X would also accept the existing 5-cent piece, but, as mentioned previously, it may seem desirable to use a different

alloy for the 5-cent piece if cupronickel is used for subsidiary coinage. No work has been done on the additional modification that would be required if the rejector were to accept a new 5-cent piece and cupronickel 10-, 25-, and 50-cent pieces, along with existing coins. One possible way in which that additional rejector modification could be avoided would be to make the 5-cent piece in a cupronickel system from nickel-silver (discussed below). The resistivities and other properties of nickel-silver and cupronickel are close enough so that both old and new 5-cent pieces would be acceptable in rejectors. On most rejectors no modification would be required on the 5-cent channels.

A much more promising resolution of vending machine difficulties would be to use outer layers of cupronickel clad on a copper core for all of the subsidiary denominations. Such coins would work in unaltered vending machine rejectors. They are discussed subsequently under the heading of "Other Clad Coins."

### **Counterfeiting Potential**

The direct counterfeiting potential with cupronickel coinage should be quite low. Despite its comparative cheapness, cupronickel is not readily available from commercial suppliers. There are vending machine problems with a proposed subsidiary cupronickel coinage, but they relate to the use of foreign coins, or expanded U.S. 5-cent coins. The problem, in the instance of vending machines, is not so much the potential use of blanks, for they would be relatively difficult to obtain.

The rejector industry representatives do anticipate that a problem would arise if the U.S. were to switch to cupronickel subsidiary coinage, because of the use in vending machines of low-value foreign coins made from cupronickel. They have furnished a lengthy list of these coins which are sufficiently close in size to the U.S. 25-cent piece to operate a rejector mechanism set for a U.S. cupronickel 25-cent piece.

In addition, there is a potential problem with a cupronickel system in that the 5-cent piece could be flattened in a hydraulic press or by some other means and used as a 25-cent piece. Whether or not this would occur on any significant scale is questionable, but it is a further minor difficulty with a cupronickel system. This particular difficulty would not be overcome by substituting a 5-cent piece made of nickel silver in the cupronickel series since the two alloys have similar electrical resistivity.

### **Ease and Certainty of Production**

The Mint has had long experience with the fabrication and minting of cupronickel. This is an important consideration where large numbers of coins may have to be produced in a very short period of time. Cupronickel is a tougher material than silver and is not quite so easy to mint. However, no unusual problems would be encountered



and cupronickel must be rated very high in terms of ease and certainty of production.

### **Cost and Availability of Raw Materials**

Cupronickel is also very attractive from the standpoint of the cost and availability of raw materials. Copper at 33 cents a pound and nickel at 79 cents a pound—alloy cost 45 cents—would be used in place of silver at \$18.81 a pound. Coinage at the projected fiscal 1965 rate would use approximately 5,355 short tons of copper and 1,785 short tons of nickel annually. Copper presents no serious supply problem on a long-run basis, although intermittent shortages and sharp price movements can be expected to occur at times. Coinage needs would be a very small fraction of total consumption. The annual amounts of nickel used would be very small relative to U.S. consumption of 124,500 short tons in 1963.

Conclusion : Acceptable as coinage alloy.

### **Copper-Zinc Alloy (98 Copper-2 Zinc)**

This alloy is red in color and its use for higher denomination coins does not merit any extended discussion. Along with similar alloys such as 96 copper-4 nickel, it does have an electrical resistivity similar to that of silver and could be used in existing rejectors. Some rejectors, which have been set specifically to reject copper slugs and cut-down pennies, would require minor adjustment. Copper-zinc coins could be easily fabricated on existing and planned Mint equipment. Because of their red color, they would merit consideration chiefly as an emergency measure, if silver were not available for coinage, and necessary vending machine adjustments were not yet complete. It is also conceivable that such an alloy might be used for the 5-cent piece if cupronickel were used for subsidiary coinage.

### **Nickel (Pure)**

#### **Public Acceptability**

Pure nickel has a density of 8.90 approximately the same as cupronickel. It is whitish-gray in color and in mint condition is generally considered to be slightly more attractive than a cupronickel coin. Wearing qualities are excellent. Nickel is being more and more widely used as a coinage material although often a silver coin of higher denomination is retained in the series. This has been the case in Switzerland, Canada, France, the Netherlands, and Japan. South Africa has recently announced plans to replace its existing subsidiary coinage of 500 fine silver (reduced from 800 fine in 1951) with pure nickel coins, while retaining one high-denomination silver coin. Pure nickel coins would probably be readily accepted by the American public. The coins are very attractive and more closely

resemble silver coinage than is the case with any of the base alloys, except nickel silver when it is in mint condition.

### **Operation in Vending Machines**

Pure nickel is magnetic and existing rejector mechanisms are designed so as not to accept coins which are magnetic. It would be necessary entirely to redesign rejector mechanisms so as to be able to pass magnetic nickel coins but to reject magnetic iron slugs. While this probably could be done, it would be very difficult and could not be done quickly, particularly since practically all coin-operated mechanisms now depend upon the magnetic principle to some extent, and many less sophisticated mechanisms depend upon it entirely. The extent of the problem may be inferred from the fact that the International Nickel Company has directed its efforts to the development of a nonmagnetic alloy (discussed below) rather than to the modification of vending machine rejectors in order to make them capable of accepting pure nickel coins.

### **Counterfeiting Potential**

Pure nickel coins would be extremely difficult to counterfeit because of the metal's relatively high melting point (2651° F.) and its hardness. There is little basis upon which to assess the potential for the use of nickel blanks, or blanks with comparable electrical resistivity, in vending machines since it is not clear what sort of rejector could be designed to accept pure nickel coins. The electrical resistivity of pure nickel is 9.5 microhms-cm. No other commonly used coinage alloy has a resistivity very close to that value although many brasses and bronzes, available commercially, do have similar resistivities.

### **Ease and Certainty of Production**

Production of pure nickel coins would pose a very difficult problem for the Mint. Existing brass mill equipment could not be used because of the high melting point of nickel. The new Mint would have to be specially designed and/or nickel strip would have to be purchased for use in existing Mint facilities. The minting of nickel coins would still be very difficult with existing equipment even if strip were purchased, but it could be accomplished.

### **Cost and Availability of Raw Materials**

Nickel costs 79 cents per pound. The International Nickel Company has estimated that at fiscal year 1965's projected rate of production of 10, 25, and 50-cent pieces about 15.7 million pounds of nickel would be required. These requirements would have to be met by imports from Canada or from the domestic stockpile. U.S. mine output comes exclusively from the Hanna Mining Company's properties in Oregon. In 1963, the nickel content of Hanna's production of ferro-



nickel was about 21.4 million pounds but this ferronickel would not be suitable for mint requirements.

Conclusion : Rejected as possible coinage alloy.

Reasons: Vending machine problem associated with use of a magnetic alloy. Otherwise acceptable, although difficult to make with existing Mint equipment.

### **Nickel (Inco Alloy 95 Nickel-5 Silicon)**

The International Nickel Company has developed an alloy of 95 nickel and 5 silicon which is nonmagnetic, thus removing, at least potentially, the major barrier to the use of nickel in slug rejectors of the present type. A further effort has been made to modify the alloy so that it will simulate the properties of 900 fine silver coinage and work in unaltered coin rejectors.

As one of their tests, existing rejectors roll the coin through a magnetic field. A coinage metal such as silver with very low electrical resistivity is slowed more in its travel, by eddy currents induced as it passes through the magnetic field, than is a material of higher electrical resistivity. Silver is a relatively "slow" coin, while cupronickel, for example, is a relatively "fast" coin. Having removed the magnetism of pure nickel coinage through the addition of 5 percent silicon, Inco technicians have sought to restore just such a sufficient degree of weak magnetism to the coin as to make it as "slow" as silver. In their most successful effort, the weak magnetism pulls the coin into contact with a piece of aluminum oxide tape which retards the rolling coin through physical friction. Without this retardation the 95 nickel-5 silicon coin would be too fast, since its electrical resistivity is higher than that of silver coins. The required magnetism has been sought at various times by adding a thin core of pure nickel, or a core of 80 percent nickel and 20 percent iron, to the coin. The 80 percent nickel and 20 percent iron core is now preferred since its magnetism does not vary within the ranges of temperature that would be encountered.

Despite this, early test results were not entirely satisfactory, and the feasibility of the Inco approach has never been demonstrated conclusively. According to the rejector industry, on its initial tests the Inco coin was only successful in fooling rejectors about 70 percent of the time; 95 to 97 percent success was required in their view. Inco subsequently demonstrated that slight modification of existing rejectors—application of the small strip of special tape referred to above—is capable of achieving a higher success ratio, at least under controlled test conditions for a limited number of trials. However, in the judgment of the vending machine and coin rejector industries, even with the application of the special tape the Inco coin cannot achieve a satisfactory success ratio under actual operating conditions. Wearing of the tape and variability in the strength of the magnets in the rejector

mechanisms could be expected to create difficult problems in actual practice. There was a comparable negative finding by Battelle on the ability of the Inco coin to work in existing vending machines.

Aside from the technical issue of use in vending machines, comment on the modified nickel coin can be relatively brief since many general comments applicable to pure nickel coinage are also applicable here.

### **Public Acceptability**

The public would seem likely to accept the modified coin about as readily as a pure nickel coin.

### **Operation in Vending Machines**

Discussed above.

### **Counterfeiting Potential**

This would be a very difficult coin to counterfeit, at least as difficult as a pure nickel coin, and probably more difficult. The use of blanks in vending machines would present about the same problem as with existing silver coins since the modified coin simulates silver's electrical resistivity. Some additional difficulty might arise if it were not possible to simulate the narrowed resistivity range of 2.0 to 2.5 microhms-cm. that some rejectors are using in order to reject copper blanks and foreign coins.

### **Ease and Certainty of Production**

It is very doubtful whether the Mint could make the modified nickel alloy; certainly it would be an expensive undertaking requiring different equipment. The necessary facilities could probably be included in the new Philadelphia Mint. If the modified alloy were to be used it apparently would be necessary to buy annealed blanks from Inco, at least until the new Mint is on stream. It is possible that current and planned rates of subsidiary coin production could be achieved using the purchased blanks. Even when annealed the alloy would be harder than cupronickel, and this makes minting a more difficult task, but not an insurmountable one. The material is being patented; exclusive rights to the patent would be turned over to the U.S. Government, for use by the Mint or designated suppliers, in the event that the Mint were to decide to use the material for coinage.

### **Cost and Availability**

Inco has estimated that the coiled strip would cost \$1.50 per pound; this includes a metal cost of about 80 cents per pound. The coinage requirements for nickel have been discussed above. At the fiscal 1965 rate, about 15.7 million pounds would be needed, roughly 6 percent of U.S. annual nickel consumption. The overall supply situation is probably adequate. It is true that nickel was regarded as scarce in the early 1950's, and it still is not in such assured supply as copper, for example.



The Bureau of Mines estimates known Canadian nickel reserves at 6 million tons and describes this as a very conservative appraisal. Canada is the principal Free World supplier of nickel and has accounted for about 80 percent of Free World production in recent years, and has supplied almost all of U.S. import requirements. Free World production of nickel was some 270,000 tons in 1963; almost half of this was consumed in the United States. If Free World consumption continued at the 1963 rate, known Canadian reserves would be depleted in about 25 years. Very large nickel reserves exist in New Caledonia and Cuba; but these should be excluded in determining the adequacy of nickel supply.

Nickel prices have almost tripled during the postwar period. Market shortages do not now exist but it cannot be said with complete assurance that they could not arise within, say, 20 to 25 years. The possibility that nickel prices could rise during that period so far as to imperil the subsidiary coinage, as has been the case with silver, is extremely remote. In this sense, nickel coinage can properly be regarded as a "permanent" solution; it would offer much less seigniorage than cupronickel.

Conclusion: Acceptable coinage alloy if consistent operation in vending machines could be demonstrated under operating conditions. Could not be fabricated on existing Mint equipment but coins could be struck at the Mint from annealed blanks.

### **Nickel Silver (65 Copper-18 Nickel-17 Zinc)**

#### **Public Acceptability**

Also termed German silver, this alloy differs from cupronickel by the substitution of zinc for some nickel and copper. Proportions can vary but the 65 copper, 18 nickel, and 17 zinc alloy is probably best suited for coinage use. Because the alloy is fairly close in metallurgical composition and other characteristics to cupronickel, its advantages and disadvantages are perhaps best established by direct comparison with cupronickel, where that is possible. Nickel silver is slightly lower in weight than cupronickel because some zinc with a density of 7.1 is substituted for nickel and copper with densities of 8.9. When newly minted, the coin is very attractive and has a silverlike appearance, but it develops a yellowish cast as it tarnishes with age, while cupronickel keeps its grayish-white color indefinitely. Wearing qualities of nickel silver are also somewhat inferior to those of cupronickel; the ring of the two coins is similar. Nickel silver is not very widely used for coinage. Some current examples are Portugal, Philippines, and Taiwan.

In general, nickel silver must be rated a little below cupronickel in most of the characteristics that would be likely to influence public acceptability. The margin of superiority for cupronickel is not ex-

tremely wide but it is consistent. Public acceptability of nickel silver might conceivably be affected adversely by the fact that it is a rather cheap silver substitute with extensive household uses, *e.g.*, it is the common base for silver-plated flatware.

### **Operation in Vending Machines**

Very little work has been done on the use of nickel silver in vending machines. However, the electrical resistivities of nickel silver (29.0) and cupronickel (32.0) are close, both are nonmagnetic, and would have similar roll properties. Nickel silver coins of the right size will work in existing rejector apparatus set for the cupronickel 5-cent piece. As noted previously, this opens the possibility of making the 5-cent piece in a new system from nickel silver and making 10-, 25-, and 50-cent pieces from cupronickel. From the standpoint of minimizing the vending machine adjustment problem another possibility would be to leave the current 5-cent piece unchanged and to introduce nickel silver 10-, 25-, and 50-cent pieces. Either system would work in the prototype NRCO Model X rejector along with existing coinage. Either system, or ones exclusively of cupronickel or nickel silver, would have a 5-cent piece that could be flattened to work as a quarter in vending machines.

### **Counterfeiting Potential**

Nickel silver would offer slightly more potential for counterfeiting than would cupronickel. Both are relatively cheap materials but nickel silver is much more readily available from a wide range of commercial suppliers. The same consideration suggests that the use of nickel silver blanks in vending machines would be more likely than cupronickel. Although the use of nickel silver blanks in the 5-cent slots of existing rejectors has not been brought to the Treasury's attention, it is possible that a problem might develop if a new system were to use nickel silver in the higher denominations.

### **Ease and Certainty of Production**

The Mint has made nickel silver coins for foreign countries and the experience was satisfactory. The melting of the alloy materials produces zinc fumes which could be a problem where Mint facilities are located in downtown regions. The fumes can be removed by the installation and operation of electrostatic precipitators, or the copper and zinc can be prealloyed in a separate melting operation. The resulting increase in cost can be estimated at roughly 10 percent. Despite this complication, nickel silver undoubtedly could be fabricated and minted in large volume on existing Mint equipment.

### **Cost and Availability of Raw Materials**

Manufacturing costs would be somewhat higher on this alloy than on cupronickel although materials cost would be slightly lower since



some zinc is substituted for copper and nickel. Zinc is only about one-sixth as expensive as nickel, and ordinarily about one-third to one-half as expensive as copper. The overall difference in cost between cupronickel and nickel silver alloys would not be large enough to influence the choice between them.

Conclusion: Acceptable as possible coinage alloy.

### Plastic Coinage

Several exploratory letters have been written to the Treasury by firms engaged in the manufacture of plastics. One firm sent a sample plastic medallion to the Treasury, but the overall appearance of the medallion did not inspire confidence as to the degree of public acceptability plastic coinage would find. It is possible that in time some combination of powdered metal and plastics technology could be used to produce satisfactory coins. However, the Treasury has no reason to believe that such developments are imminent. The case for the introduction of plastic coins was argued by the Comptroller of the Royal Mint several years ago. At the time this aroused some interest in plastic as a coinage material. This interest seems now to have ebbed. There are no known instances of the use of plastic as a coinage material, and it must be rejected from consideration on the basis of the present technology. Much the same verdict must be given on glass coins.

Conclusion: Rejected—poor quality and probable public aversion to nonmetallic coins.

### Stainless Steel

#### Public Acceptability

Stainless steel is lighter than most of the conventional coinage materials with a density of about 7.8 to 8.0 depending upon its composition. Coins made of stainless steel are white in color and their wearing qualities are superior to those of any other coinage material, except possibly pure nickel coins. Because stainless steel is very hard, coins have to be made with less relief, *i.e.*, the design and lettering are not raised as far from the coin background as in the case of coins made from softer alloys. The overall appearance of stainless steel coins suffers as a consequence. The foreign use of stainless steel coins is limited to Italy (100 and 50 lire) and Turkey. Public acceptability of stainless steel coins in this country is conjectural.

Plain carbon steel can be clad with a relatively thin layer of another material, usually about 15 percent of the thickness on each side. Cladding materials currently being used in this way are nickel and cupronickel in Argentina, brass and copper in West Germany. The edges of these coins are unattractive and susceptible to rust. The coins do not merit serious consideration for use in this country.

## Operation in Vending Machines

Vending machine test results on stainless steel have not been encouraging to date. Stainless steels containing 10 percent and more of nickel are nonmagnetic in their unworked state. But, a major difficulty is that so-called nonmagnetic stainless steels become magnetic when cold-worked, and the coins would then be rejected in vending machines. Three types of stainless steel, presumably nonmagnetic, were supplied for rejector tests. Blanks made from each of the three types of steel were refused by the rejectors. These blanks had been upset at the Mint before testing and even this small amount of fabrication was apparently sufficient to induce some magnetism. The actual stamping process might well have an even stronger effect upon stainless steel blanks. It may be that some stainless steel, suitable for coinage, can be found that will remain nonmagnetic.

Assuming that a stainless steel can be found that will remain nonmagnetic under deformation, the nature of the required adaptation of rejectors will then depend upon the electrical resistivity of the stainless steel. The National Rejector Company has done some work on the problem of building a rejector that would accept silver coins and stainless steel coins of relatively high resistivity (*e.g.*, 75 microhms-cm.). It should be noted that a rejector such as the one NRCO is working on would continue to accept the cupronickel 5-cent piece. No work has been done, so far as is known, on the presumably more difficult problem of designing a rejector that would accept existing coinage, a stainless steel 5-cent piece, and cupronickel 10, 25, and 50-cent pieces.

## Counterfeiting Potential

Actual duplication of a stainless steel coin would be a very difficult task because of the hardness of stainless steel. Although direct counterfeiting would probably not constitute a serious problem because coins would be so difficult to mint, the use of stainless steel blanks in vending machines would seem to pose a threat of some consequence. Material from which blanks could be made would be readily available. It might be possible to find a stainless steel for coinage purposes which had electrical resistivity unlike that of the more readily available types but this is by no means certain.

## Ease and Certainty of Production

Stainless steel presents serious problems for the Mint. It would be necessary, pending the construction of necessary facilities, to purchase the stainless steel from outside suppliers in the form of strip. Even so, the methods of coin fabrication would be entirely different from those used in the past, or those that are presently contemplated for the new Mint. It is true that the Mint made some magnetic stainless steel coins for Costa Rica but only with great difficulty. Mint experience on that production established that entirely new fab-



rication techniques would be required for coins larger than the U.S. 25-cent piece.

Conclusion: Rejected as possible coinage alloy.

Reasons: Some question as to public acceptability, replacement of existing vending machine rejectors, and difficult production problems.

### **Silver (500 Silver-500 Copper)**

#### **Public Acceptability**

Silver coins of 500 fineness would be slightly lighter than existing coins because the density of copper is less than that of silver. The present 50-cent piece weighs 12.50 grams; a silver 50-cent piece of 500 silver and 500 copper would weigh 11.66 grams. It would be possible to tell 500 fine coins from 900 fine coins simply by weighing the coins in question.

Newly minted 500 fine silver coins could be made to resemble existing silver coins by being given an acid bath at a final production stage. This bath etches away the copper from the surface of the coin, leaving a thin film of silver. With wear, now intensified by the use of coins in vending machines which test for size, the external film of silver is rubbed off. This exposes reddish and yellowish areas on the coin and gives it an unattractive mottled appearance.

Largely because of these poor wearing qualities, 500 silver-500 copper is not generally considered to be an acceptable coinage alloy. The last country using 500 silver-500 copper is South Africa which has recently announced its decision to replace the 500 alloy with pure nickel coins.

Public acceptability of a 500 silver-500 copper coin is highly questionable.

#### **Operation in Vending Machines**

A strong point with 500 silver-500 copper coinage is the very minor adjustment of vending machine rejectors that would be required. The slight change in weight and electrical resistivity from existing silver coinage would not affect the majority of vending machines at all. Some vending machine rejectors whose selectivity range has been made very narrow would probably require some adjustment. For all practical purposes, it can be said that the 500 silver-500 copper coinage would work in existing rejectors.

#### **Counterfeiting Potential**

There probably would be no serious increase in counterfeiting potential with the 500 silver-500 copper coinage, at first. As worn 500 fine coins began to make up the bulk of coins in circulation, some wider latitude for counterfeit coins would begin to emerge to the extent that the worn 500 fine coins would be less readily distinguished than the present coinage from cheap imitations made from base metals.

The use of blanks in vending machines should be only slightly more serious with 500 fine silver than it is at present.

### **Ease and Certainty of Production**

It is estimated that the use of an acid bath treatment to improve the initial appearance of the coins would increase current Mint operating costs by about 10 percent. In addition, new equipment and additional space would be required which the Mint does not have at present.

### **Cost and Availability of Raw Materials**

The reduction of silver content from 900 to 500 fineness would reduce the direct cost of coinage metal by more than 40 percent for a given level of silver prices. Questions of the availability of raw materials are complex and center upon the adequacy of Treasury silver stocks to meet future coinage demand, without recourse to market purchases. These questions are discussed subsequently.

Conclusion: Rejected.

Reasons: Very poor appearance when worn. A quaternary silver, discussed next, is preferred on the basis of wear characteristics. A clad silver coin, subsequently discussed, would have the desirable vending machine properties of 500 silver-500 copper.

### **Silver Alloy—United Kingdom (500 Silver-400 Copper-50 Nickel-50 Zinc)**

#### **Public Acceptability**

The United Kingdom and a large number of other countries have in the past used an alloy consisting of 500 silver, 400 copper, 50 nickel, and 50 zinc. Sweden coins an alloy of 400 silver, 500 copper, 50 nickel, and 50 zinc; Finland, one of 350 silver, 570 copper, and 80 zinc; and Mexico, one of 100 silver, 700 copper, 100 nickel, and 100 zinc. The addition of nickel and zinc to low silver content alloys reduces the rate of deterioration in appearance. When newly minted the coins, and even those of lower fineness than 500, are relatively attractive. However, the appearance of circulated coins would still leave much to be desired, despite the addition of nickel and zinc that helps to delay the appearance of the mottled surface that is characteristic of coins of low silver content. On technical and metallurgical grounds, the 500 quaternary alloy is not acceptable if coins are required to wear well and retain their appearance for 20 to 25 years. Consequently, it is clear that the alloy merits consideration only if a very high premium is placed upon the retention of some silver in the coinage. Even then, in the judgment of the Mint technical staff, the quaternary alloys would be a poor way to accomplish this end. Silver clad coins with high content silver as the outside layers would be preferable on the grounds of appearance and wear characteristics.



## **Operation in Vending Machines and Counterfeiting Potential**

The addition of nickel and zinc in the quaternary alloy raises the electrical resistivity of the hardened coin to about 6.8 microhms-cm. This means that the coins would not work in vending machines with the eddy-current rejector. The resistivity range of rejectors could probably be widened to accept the existing coinage and the quaternary alloy but this would be a major undertaking, involving major revamping or replacement. Furthermore, if this were done, vending machines would be much more vulnerable to a variety of foreign coins and blanks than they are at the present time. The potential for direct counterfeiting of this alloy would not differ greatly from that for 500 silver-500 copper.

## **Ease and Certainty of Production**

A quaternary alloy is a much more difficult problem for the Mint but it could be made without drastic change in existing procedures and equipment. The most significant modification of current practice would be the double melting process required so that zinc could be added in alloy form. Approximately a 30-percent increase in melting equipment would be required.

## **Cost and Availability of Raw Materials**

As in the case of 500 silver-500 copper, the major uncertainty is the price and availability of silver in the event that Treasury stocks did not prove adequate to meet coinage and other requirements.

Conclusion: Barely acceptable as a coinage alloy.

## **Silver Clad Coins**

Battelle has examined a wide range of multilayered coinage materials, including some with high-content silver alloys as the outside layers. The inner core on these coins could either be pure copper or a low-content silver-copper alloy with the overall fineness of the alloy varying according to the exact specifications of the outside layers and the inner core. If the present 900 fineness alloy were to be clad on a pure copper core, the resulting material would be approximately 400 in fineness. Much the same overall fineness could be achieved by using 800 fineness silver as the outside cladding and substituting a low-content silver-copper alloy as the inner core. For example, the Mint has made experimental strikes from 800 fineness silver clad on a 215 fineness silver-copper core which gives an overall fineness of 400.

The requirement of a minimum thickness of cladding to insure reasonable wear characteristics precludes any marked reduction in overall silver content and for practical purposes an average fineness of 400 can be taken as broadly representative of the minimum silver content, acceptable from a technical and metallurgical standpoint, where high fineness silver is clad on a pure copper or a low-content silver core.

Any fineness much lower than 800 in the outside cladding would not make an acceptable coin.<sup>1</sup>

### **Public Acceptability**

Silver-clad coins would be quite attractive in appearance if the outside cladding were at least 800 fineness. In such a case, the color would be the same as that of the present silver coinage except on the edges of the coins. When the core is composed of silver-copper alloy the edges of newly minted coins differ very slightly from the present coinage. Wear characteristics of silver-clad coins would be satisfactory if minimum thickness requirements were observed on the outside cladding.

### **Operation in Vending Machines**

The high silver-copper clad on low silver-copper alloys would work in all vending machines without adjustment. If a pure copper core were used, most machines would need adjustment and pure copper slugs would then be accepted.

### **Counterfeiting Potential**

Clad coins would be more difficult to counterfeit than the existing silver coinage.

### **Ease and Certainty of Production**

The Mint has a substantial but limited capacity for the melting and rolling of silver-copper alloy strips but would probably have to purchase strip from outside suppliers. As a general proposition, it appears that the cladding of silver would present some difficulties where dependence had to be placed upon outside suppliers for a large volume of material. In any event, all bonding (cladding) operations would have to be performed in private plants.

### **Cost and Availability of Raw Materials**

As with coinage of 500 fineness, the crucial question is whether Treasury stocks of silver would be adequate to meet longrun coinage requirements, and, if not, what effect Treasury purchases of silver in the market would have upon price.

**Conclusion:** Acceptable coinage alloy from a technical and metallurgical point of view.

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<sup>1</sup> On the basis of their analysis of the overall silver situation, Battelle determined that it would probably be necessary to reduce the silver content of the coinage to about 15 percent, and even so the need might arise to abandon silver altogether as a coinage material sometime in the 1970's. Consequently, their primary recommendations were for base alloy coinage, but they also suggested that if any silver were to be retained in the subsidiary coinage, it should either be limited to a high-content half-dollar or spread very thinly through the subsidiary coinage. In the latter case, they suggested that a 400 fineness silver quaternary alloy used as outside cladding on a copper-alloy core "might possibly meet minimum standards of acceptable appearance." In the judgment of the Mint technical staff, the quaternary silver alloys are undesirable on technical and metallurgical grounds and the exterior silver cladding on any composite coin should not be reduced below 800.



## **Other Clad Coins: Cupronickel (or Nickel-Silver) Clad on a Copper Core**

The multilayer principle recommended by Battelle can be applied to base alloy coinage. Coins with outer layers of cupronickel clad on a copper core will operate in existing vending machine rejectors along with the present silver coinage (probably nickel-silver would also work as outside cladding but tests have not been made). This resolution of the vending machine problem would allow the rapid introduction of new coins without the difficulty, expense, and inconvenience of modifying existing coin rejectors. On the other hand, the clad coins would be more expensive to produce than the straight cupronickel alloy and strip will have to be purchased from outside suppliers.

### **Public Acceptability**

These cupronickel clad coins would be only slightly lighter in weight than the existing coinage. The color of the coins with cupronickel cladding is very good. Because of the copper core, a reddened edge is exposed in the blanking process. Milling of the coins improves their appearance. Wear tests conducted by Battelle and by the Mint technical staff point to an expected average life of 20 to 30 years. The coins are expected to retain an attractive appearance throughout their life in circulation.

### **Operation in Vending Machines**

As recommended by Battelle, the Mint and the rejector industry have conducted extensive testing of the operation of cupronickel clad coins in existing vending machines. This testing has demonstrated that when produced according to specifications (which are not intolerably narrow) these coins work in unaltered vending machine rejectors.

### **Counterfeiting Potential**

The reddened edge of these coins and the difficult production process for the clad material from which they are made should insure against counterfeiting on any substantial scale. Vending machines set for silver coins will accept these clad coins and in time, the sensitivity of rejectors could even be narrowed slightly from their present settings if desired.

### **Ease and Certainty of Production**

The Mint has made sizable production runs using the cupronickel clad material and has not encountered any difficulties of consequence. Given adequate supplies of the clad strip, high levels of production on the new coins could be reached quickly.

### **Cost and Availability of Raw Materials**

The availability of the cupronickel clad strip from outside suppliers has been under intensive investigation by the Mint. This investigation

is continuing but enough is known at this time to insure that adequate supplies of the strip will be available to support the full-scale production effort on the new coins that will be necessary during any transition to a new coinage system. Cost estimates are not yet entirely firm but it appears that the processing cost on the strip material will be in the neighborhood of \$1 per pound, perhaps less as experience is gained with large-scale production.

Conclusion : Acceptable coinage material.

### **Titanium**

Titanium has been suggested to the Treasury as a coinage material but does not appear to be suitable. A major shortcoming is the alloy's light weight. No work is known to have been done on the rejector problem, nor is there any experience with mint fabrication of the metal. The melting point of titanium is too high to permit the use of ordinary brass mill equipment.

Conclusion : Rejected.

### **Zirconium-Hafnium**

Zirconium-hafnium has been suggested to the Treasury as a possible alloy from which 50-cent pieces might be made. However, the cost of the alloy would appear to be prohibitive, wholly aside from other considerations. Zirconium strip was quoted to the Treasury at about \$8 per pound—the 1963 *Minerals Yearbook* quotes \$10 to \$14 per pound. However, the addition of hafnium, recommended to enable the detection of counterfeit coins, would raise the price sharply. Hafnium is quoted at \$138 a pound. One company thought that a zirconium 88-hafnium 12 alloy could be provided at a cost about equal to silver with some chance that the resulting volume of production might lower the cost to 50 percent of silver. Under the circumstances, neither zirconium nor zirconium-hafnium appear to be eligible coin alloys.

Conclusion : Rejected.

### **Summary**

For summary of the material in Section IV, see the tables in the Summary at the beginning of the document.



## V. Problems With a Changeover to Reduced Content Silver Coinage

The discussion of technical and metallurgical considerations has reduced the potentially acceptable coinage materials to six. These are: cupronickel (75 copper-25 nickel), nickel silver (65 copper-18 nickel-17 zinc, or slightly different proportions), cupronickel or nickel silver clad on a copper core, the INCO alloy (95 nickel, 5 silicon with a magnetic core), the United Kingdom silver alloy (500 silver, 400 copper, 50 nickel and 50 zinc), and silver clad alloys (overall fineness about 400). The present section discusses the feasibility of a changeover to silver coinage of reduced content; a section to follow will discuss similar problems for the base alloys.

### Special Problems With the Silver Alloys

The major questions not yet discussed with respect to the two reduced content silver alloys—the United Kingdom quaternary and silver clad—are whether Treasury silver stocks would be large enough to achieve two objectives: (a) Hold the spot market price of silver below \$1.29+<sup>1</sup> by means of redemptions and/or sales of silver to the market during a period of transition, and (b) meet Treasury coinage requirements after the period of transition and thereby minimize the danger that the longrun market price of silver would again imperil the subsidiary coinage.

The first objective of holding the market price during the transition period is absolutely essential to protect the existing coinage. If the market price were to break loose, much of the existing coinage would quickly go out of circulation and there would be a risk of serious disruption to commerce. The second objective of retaining large Treas-

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<sup>1</sup> It is occasionally suggested that the line be held at \$1.38+, instead of \$1.29+ since silver dollars are not likely to stay in circulation anyway. It is also suggested that some such rise in price might be induced by making those who want silver collect their own silver certificates; otherwise it is clear that the law would have to be altered so that the redemption right did not continue to place an effective ceiling at \$1.29+. In any event, the slight narrowing of excess market demand that the 9-cent price increase might conceivably encourage would surely be outweighed by the immediate stimulus that would be given to large private speculative purchases of silver, spot and forward. The judgment of anyone who had earlier gone long on silver at \$1.29+ would be vindicated. Although some profit taking might result, the net effect would undoubtedly be to encourage much larger speculative positions in anticipation of the next price increase. If the Treasury could assure the market that the \$1.38+ line would be held indefinitely, a move to \$1.38+ might be regarded as advantageous. It is very hard to see how the market could be sure that the new ceiling would be held after the earlier one had been abandoned.

ury stocks of silver after the transition is perhaps not quite so vital, but it would be difficult to recommend reduced content coinage if it were uncertain that Treasury stocks of silver would meet coinage needs for a good many years after the transition period.

The approach employed here will be to work through arithmetic examples of the possible effect upon Treasury silver stocks of two alternative ways in which the transition to reduced content silver coinage might be attempted. These examples are not intended as definite forecasts of what would necessarily happen.

Forecasting the future behavior of silver markets is extremely hazardous. This, itself, cannot fail to be a major factor in determining the eventual decision on coinage alloys. However, despite the wide margins of uncertainty, it is believed that the examples presented here provide some insight into the feasibility of a transition to silver coinage of reduced content. While every effort has been made to choose assumptions that seemed inherently plausible and consistent with the available data, inevitably the choices may be subject to question. Therefore, the assumptions that have been made will be discussed in some detail, and the components of the projected changes in silver stocks will be separated as clearly as possible.

### **The Mint Coinage Estimates**

The basic coinage estimates in Table 1 were supplied by the Mint. The columns for 500 fineness coinage reflect an assumption that, because of the time required to obtain necessary legislation for a change in coinage alloys, the change to 500 fineness coinage would not occur until January 1, 1966. The estimates of total coinage requirements are based upon an assumption that the crash coinage program will have been concluded by the end of fiscal 1966, after which time the Arthur D. Little trend estimates of coinage requirements will be valid. Fiscal 1964 coinage is actual, while the estimates for fiscal 1965 and 1966 are based upon the latest budget estimates.

Other tables in this section use the Mint coinage estimates, adjusted to a calendar year basis, and the figures for calendar 1964 will differ slightly from the actual amounts of silver that were used. Additional assumptions regarding redemptions, transitional and replacement coinage requirements, and recovery of old coinage have been made in the course of the present study and underlie the arithmetic of some of its tables.

### **Treasury Recovery and Replacement of the Existing Coinage**

It will be useful to begin with a brief description of the way in which the Treasury might attempt a transition to reduce content silver coinage. The Treasury would have to plan to recover as much as it



could of the 900 fineness coinage, meanwhile producing new lower content coins at a rate sufficient to insure an adequate supply of total coinage at all times. Throughout this process, the price of silver would have to be held below the melting point of the 900 fineness coinage in order to assist the recovery of old coin. It would not be sufficient merely to prohibit the melting and export of coins since hoarding could also prevent the Treasury from making substantial recoveries. Indeed, controls over the melting of coins are redundant so long as the market price of silver can be held and they are likely to be ineffective if the market price cannot be held. As discussed later, it may nevertheless be desirable for the Treasury to obtain standby authority for controls over the melting, hoarding, and export of coin and bullion.

TABLE 1.—*Estimated Use of Silver Bullion for Coinage at 900 and 500 Fineness*

[In millions of fine troy ounces]

Fiscal year	Estimated silver needed for coinage during year	
	900 fine coinage	500 fine coinage
1964.....	144. 0	144. 0
1965.....	272. 2	272. 2
1966.....	330. 0	256. 4
1967.....	119. 9	66. 0
1968.....	111. 9	61. 6
1969.....	116. 3	64. 0
1970.....	120. 2	66. 2
1971.....	125. 3	69. 0
1972.....	130. 0	71. 6
1973.....	135. 4	74. 6

Source: Bureau of the Mint.

Attempting to call in the old coinage and have it exchanged for the new coinage does not appear to be practical or desirable. It would be too difficult, indeed impossible with present Mint facilities, to produce and accumulate a substitute set of coins while also meeting current coinage requirements.

Table 2 summarizes a hypothetical situation in which the Treasury attempts recovery of the existing coinage through ordinary channels in a transition to 500 fineness silver coinage—the United Kingdom alloy with 400 copper, 50 nickel, and 50 zinc. Column (1) of Table 2 presents an adaptation of the Mint coinage projections of Table 1. In Table 2, coinage estimates have been placed on a calendar year basis by successive averaging of Table 1's fiscal year figures, and it is as-

sumed that 500 fineness coinage would not begin until January 1, 1967, because of the need to modify existing rejector mechanisms.

It will be recalled that the addition of nickel and zinc to the alloy raises its electrical resistivity out of the resistivity range of the present silver coins. It is possible that the vending machine adaptation could be accomplished more rapidly than is assumed in Table 2. In such a case, the introduction of the new coins might even be brought forward to January 1, 1966. The essential conclusions to which Table 2 points would not be greatly modified as a result.

TABLE 2.—*Projected Behavior of Treasury Silver Stock Through Calendar Year 1972 Where Coinage of 500 Fineness Begins Jan. 1, 1967, 900 Fine Coinage Is Partially Recovered and the Market Price of Silver Is Held at \$1.29+ During a 4-Year Transition Period*

[Millions of fine troy ounces]

Calendar years	Potential amounts of silver used in coinage				Potential amounts of silver used in redeeming silver certificates or in making outright sales to the market	Treasury recoveries of 900 fineness coinage	Treasury silver stock at end of period
	Mint projection of ordinary requirements	Increments required to replace Treasury recoveries of 900 fineness coinage	Increments required to replace portion of coinage not recovered	Total coinage required			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1964.....	-208.1	-----	-----	-208.1	-150.0	-----	1,200.0
1965.....	-290.9	-----	-----	-290.9	-100.0	-----	809.1
1966.....	-225.0	-----	-----	-225.0	-75.0	-----	509.1
1967.....	-64.4	-222.2	-83.3	-369.9	-75.0	+400.0	464.2
1968.....	-63.4	-166.7	-83.3	-313.4	-75.0	+300.0	375.8
1969.....	-65.7	-111.1	-83.3	-260.1	-100.0	+200.0	215.7
1970.....	-68.2	-55.5	-83.3	-207.0	-150.0	+100.0	(-)
1971.....	-70.9	-----	-----	-70.9	-----	-----	(-)
1972.....	-73.7	-----	-----	-73.7	-----	-----	(-)

NOTE.—Column (2) equals  $\frac{5}{6}$  of column (6); column (3) equals  $\frac{5}{6}$  of total nonrecoveries of 600, divided equally among the 4 years.

It is possible to conceive of even earlier introduction of the new coins. This would cause some disruption because the new coins would not work in all vending machines. As long as the new coins were a fairly small part of all coins in active circulation, the situation might be tolerable. However, the new coins would require a slightly different production process, and it does not appear that it would be possible to start production much before early 1966 under the best of circumstances.

The treatment of silver dollars in Table 2 and all of the subsequent tables in this section is the same and should be explained at this point. The 45 million authorized for this fiscal year have not been produced, and it is possible that they will not be. However, this will not reduce the overall amount of silver used by the Mint. The chief limitation on current production of subsidiary coinage is the amount of slab anneal-



ing capacity in the Mint. It is understood that silver not used in coining silver dollars would be used in subsidiary coinage, up to the limit imposed by annealing capacity, during the remainder of the crash coinage program. Therefore, the amount of silver originally included for silver dollars is appropriately left in the tables during the crash coinage program.

Columns (2), (3), and (6) of Table 2 all relate to the recovery and replacement of the existing coinage. Estimates of the silver content of subsidiary coinage that would be in circulation at the time of the transition are necessarily approximate; but the Mint estimates that something like 1,600 million ounces of silver is probably outstanding in the form of subsidiary coinage. In a recent press release, the American Mining Congress has mentioned a figure, apparently based upon *Circulation Statement* estimates, of 1,400 million ounces in subsidiary coinage, and 400 million in silver dollars, for a total of 1,800 million ounces, of which they feel foreign experience suggests that some two-thirds, or 1,200 million ounces, could eventually be recovered by the Treasury.<sup>1</sup> It would seem unwise to count on recovering any 900-fineness silver dollars, and the Mint figure of 1,600 million ounces of subsidiary coinage will be taken as representative of the size of the pool from which recoveries might be made.

How much of the old coinage really could be recovered by the Treasury is very uncertain. It has been suggested that, on the basis of foreign experience, eventually as much as two-thirds of the old coinage could be recovered. However, the attempt to recover our existing coinage would come at a time when severe coin shortages have just been overcome and would have to proceed with the market price of silver at its monetary ceiling. Hence, the foreign experience of substantial recoveries may well be irrelevant.

A question also exists as to the probable time profile of the recovery of the old coinage since it obviously would not "pay" to hold the price of silver indefinitely while only a trickle of recoveries was being made. Current figures on the flow of coin to and from the Reserve banks are not of much aid in this connection because they are distorted by the coin shortage and consequent changes in the circuit flow of coin. This changing pattern is reflected in Chart I which shows coin payments and inventories of the Federal Reserve banks and their receipts of coin from the Mint and the member banks since 1961. The success of

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<sup>1</sup> On the basis of a statistical sampling of the age distribution of coins in circulation, Arthur D. Little Inc., estimated the value of silver subsidiary coinage in circulation on January 1, 1963, at \$1,117 million, a silver content of about 900 million fine ounces. (See *Hearings on S. 874* before the Subcommittee on Financial Institutions of the Senate Committee on Banking and Currency, March 26, 1963, pp. 117-120.) On January 1, 1963, the *Circulation Statement* showed a value of \$1,739 million, a silver content of about 1,400 million ounces. The Mint estimates used in this section imply a loss rate falling between that in the A. D. Little study and that used in the *Circulation Statement*.

the Mint crash coinage program in rebuilding coin inventories during early 1965 is clearly apparent. However, in the present context, it is the reflow of silver subsidiary coinage that is pertinent. This is shown separately in Chart II. The statistics for fiscal 1961 and 1962 do indicate relatively large annual gross flows of subsidiary silver coin back to the Federal Reserve banks in normal periods. However, these data are seriously defective for the purpose at hand, not only because of the constricted flows now occurring, but also because there is no way of knowing to what extent the larger flows in earlier years simply reflected a continual recycling between the Reserve banks, the member banks, and some coin users of a relatively small fraction of the total outstanding coinage.

Column (6) of Table 2 shows total Treasury recoveries of 1,000 million ounces over a 4-year period, with recoveries declining steadily. Total recoveries are placed at five-eighths, rather than two-thirds, of the amount assumed to be in circulation because only 4 years are allowed for the recovery period, instead of the longer period to which the estimate of two-thirds recovery must be taken to refer. Even so, the estimate of recoveries is very generous, and to recover this amount of coin in 4 years it is doubtful whether the Treasury could depend solely upon routine recovery through the Federal Reserve banks even if there were no coin shortage. The cooperation of commercial banks and coin-collecting agencies probably would have to be sought. It should be emphasized very strongly that unless the coin shortage had been entirely broken by the time recovery of the old coinage was attempted, nothing like this amount of coinage could possibly be recovered. The estimated scale of recovery is included in Table 2 and later tables not because it is inherently plausible, but simply to work out the implications of attempting a transition to reduced content silver coinage under favorable circumstances.



Chart I  
Federal Reserve Bank Subsidiary and Minor Coin Payments,  
Inventories, Receipts from the Mint, and Member Banks, 1961-1965  
(in millions of pieces)

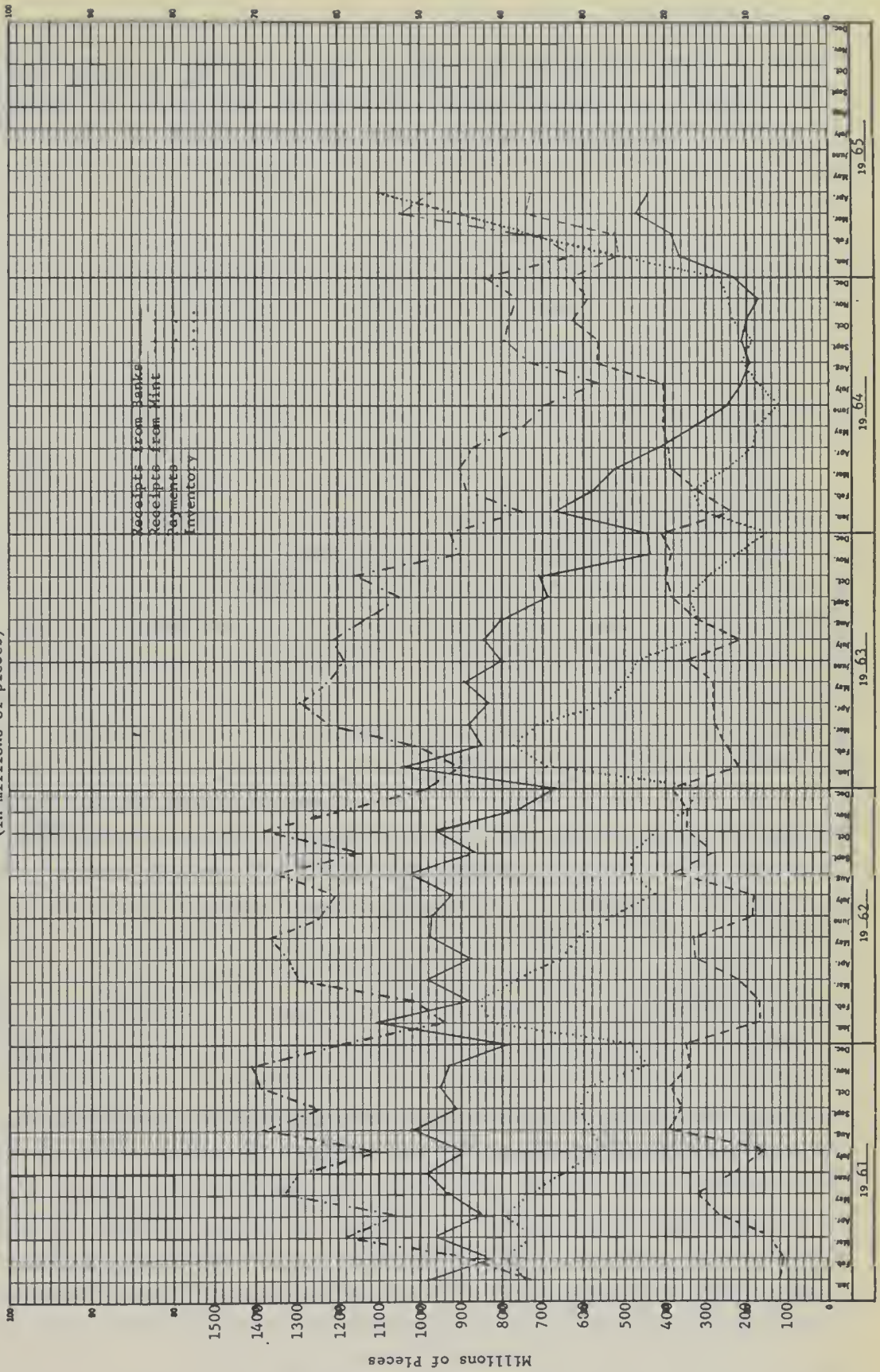
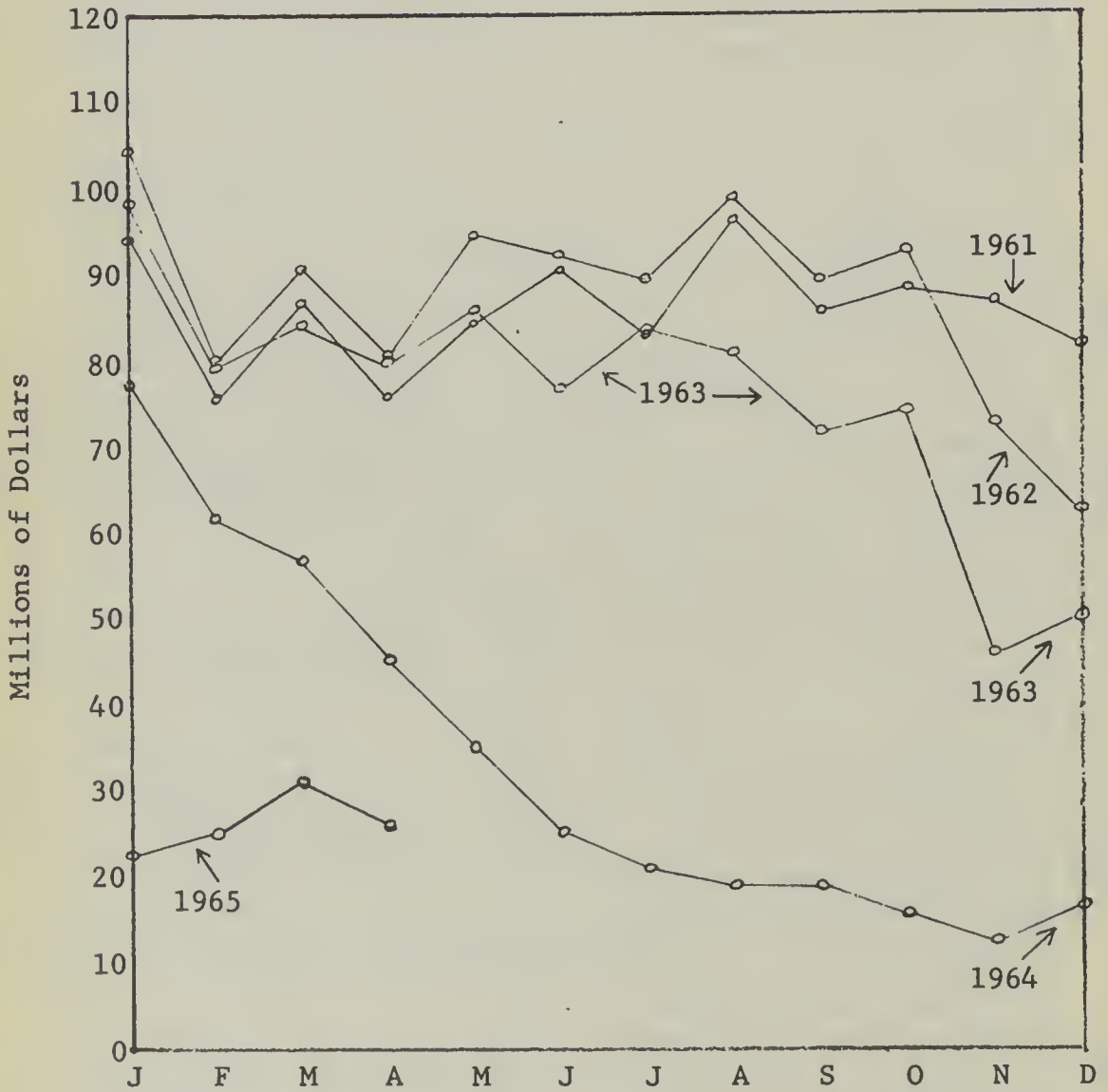


Chart II

Receipts of Silver Subsidiary Coins by the Federal Reserve Banks from Member Banks and Others, Exclusive of Receipts of Coin from the Mint, Monthly, 1961-1965





The gross recovery of the existing coinage by the Treasury is not a net addition to Treasury silver stocks because of the need to replace the higher content coin withdrawn from circulation. Additionally, the Treasury probably should plan to replace the higher content coinage which is not recovered, since it would have to be assumed that much of it had been hoarded and would no longer be available for transaction purposes. The estimates of coin in circulation possibly include a certain amount of coin that has been lost. Although the Mint estimates do attempt to correct for this, the correction may not be entirely adequate. Hence, complete replacement of the coinage recorded as being in circulation would not necessarily be essential. The table is constructed on the assumption that complete replacement is attempted. The effect of relaxing this assumption will be noted subsequently.

Column (2) shows the amounts of 500 fineness coinage required to match recoveries of 900 fineness coinage, and column (3) shows the estimated amounts required to offset nonrecoveries. On the assumption of total recoveries of 1,000 million ounces from a stock of 1,600 million ounces, there are 600 million ounces of the old coinage to be replaced at five-ninths of the original fineness. The amount is allocated in column (3) evenly among the 4 years. The sum of columns (1), (2), and (3) gives the total coinage requirements which the Treasury should plan to meet.

In addition, some silver would have to be used to hold the market price of silver during the transition period. Column (5) shows the amounts of redemptions or outright sales to the market that might be required. It should be noted in this connection that to revoke the redemption right would not free the Treasury from the need to sell silver to the market. Protection of the existing coinage requires that the market price of silver be stabilized; this requires sales of silver to the market equal to excess demand at the stabilized price; whether or not certificates are retired is a separate, although important, question.

The amounts shown in column (5) for market stabilization are necessarily fairly approximate, although they do not seem unreasonably high in the light of recent experience. Bullion exchanges against silver certificates in 1964 were close to 150 million ounces. It is assumed that excess demand would decline to 100 million ounces in 1965, reach a "normal" level of about 75 million ounces by 1966, and remain there through 1968. As the transition period neared completion, the market would come to expect an increase in the price of silver and some speculative demand would be added to ordinary requirements. Therefore, sales to the market are increased to 100 million ounces in 1969 and to 150 million ounces in 1970.

Such a pattern of Treasury sales does not make allowance for any strong feedback from the sharply falling silver stocks in column (7) to the redemptions in column (5). Yet, as the stock of silver fell, there could be an acceleration of redemption demands. Very heavy speculative pressure could develop in the case of any transition to silver coinage of reduced content. The rate of redemptions in late 1964, during a mild speculative flurry, should remain as a sobering reminder of the potential scale that speculation in silver can quickly take.

The decline in Treasury silver stocks on the assumptions embodied in table 2 would be rapid. Despite the recovery of a large amount of 900 fineness coinage, stocks would be entirely exhausted before 1970. The overall result is not very sensitive to moderate changes in the assumptions that underlie it, although the exact point at which Treasury stocks would run out is shifted in time by most changes in assumptions.

On the assumptions of Table 2, about 300 million ounces of silver are used in replacing the coinage that is not recovered. It could be argued that this need not be done because some unrecovered coin will have been recorded in circulation when it actually was lost. This may well be true and implies that not all of the unrecovered coin need be replaced. However, to argue that none of it need be replaced is to assume that the coinage stock just prior to the transition would be in excess of public requirements so that some increase in hoarding could be tolerated. Certainly there is no present evidence that the stock of silver coinage is excessive relative to the demand for it. It is very difficult to know how much, if at all, the more than 300 million ounces of silver scheduled to be used in replacing unrecovered coinage could safely be reduced. Therefore, the table carries the full amount.

It could also be argued that the time pattern of recovery of old coin might be more rapid than has been assumed here. This would permit a shorter transition period and possibly reduce the overall amounts of silver used in stabilizing the market price. The problem here is in knowing just what degree of shortening of the time pattern of recovery would be a practical possibility. This is explored subsequently with the aid of an example based upon slightly different assumptions.

In summary, if it were decided to try to replace the existing coinage, the likelihood of successfully negotiating a transition to subsidiary silver coinage of 500 fineness does not appear to be very great at all. On the assumptions used here, the Treasury would be back in the market before the transition was even complete, but the Treasury would now be buying silver to meet its coinage requirements,



rather than selling to protect the existing coinage. The total exhaustion of Treasury silver stocks before the transition was even completed would not necessarily occur on all assumptions. With a shorter period of transition, instituted somewhat sooner, the savings in the sales or redemptions required to peg the market price of silver could be sufficient to leave the Treasury with some silver after the transition. On any reasonable set of assumptions, however, it does not appear that the Treasury would be likely to have very much silver left.

The general conclusion remains, therefore, that it would appear to be impractical and extremely hazardous to attempt to replace the existing subsidiary coinage with 500 fineness silver.

### **Recovery and Replacement With 400 Fineness Coinage**

Table 2-A presents the comparable situation where a transition is attempted to subsidiary silver coinage of 400 fineness; for example, 800 fineness silver clad on a low-content silver-copper core. The picture is somewhat improved relative to 500 fineness coinage, although the decline in Treasury silver stocks is still very rapid. The decline in Treasury silver is not quite so precipitous for two reasons. First, new coinage at the 400 fineness rather than 500 takes only four-fifths as much silver. Second, coins made from silver clad on a copper core would work in existing vending machines. Hence, it is assumed that the production of new coins, and recovery of old coins, could begin on January 1, 1966. This shortens the transition period and reduces the amount of silver that must be used to stabilize the market price of silver at the melting point of the old coinage. The transition could not begin much sooner than January 1, 1966, because of the probable leadtime required for the production of required amounts of the clad strip. Other assumptions are the same as those discussed for the transition to 500 fineness and do not require additional comment now, other than to reiterate the earlier warning that recovery of any substantial part of the existing coinage in present circumstances seems extremely doubtful.

TABLE 2-A.—*Projected Behavior of Treasury Silver Stock Through Calendar Year 1972 Where Coinage of 400 Fineness Begins Jan. 1, 1966, 900 Fine Coinage Is Partially Recovered and the Market Price of Silver Is Held at \$1.29+ During a 4-Year Transition Period*

[Millions of fine troy ounces]

Calendar years	Potential amounts of silver used in coinage				Potential amounts of silver used in redeeming silver certificates or in making outright sales to the market	Treasury recoveries of 900 fineness coinage	Treasury silver stock at end of period
	Mint projection of ordinary requirements	Increments required to replace Treasury recoveries of 900 fineness coinage	Increments required to replace portion of coinage not recovered	Total coinage required			
	(1)	(2)	(3)	(4)		(6)	(7)
1964.....	-208.1			-208.1	-150.0		1,200.0
1965.....	-290.9			-290.9	-100.0		809.1
1966.....	-102.5	-177.8	-66.7	-347.0	-75.0	+400.0	787.1
1967.....	-52.8	-133.3	-66.7	-252.8	-75.0	+300.0	759.3
1968.....	-52.0	-88.9	-66.7	-207.6	-100.0	+200.0	651.7
1969.....	-53.9	-44.4	-66.7	-165.0	-150.0	+100.0	436.7
1970.....	-55.9			-55.9			380.8
1971.....	-58.1			-58.1			322.7
1972.....	-60.4			-60.4			262.3

NOTE.—Column (2) equals ⅔ of column (6); column (3) equals ⅔ of total nonrecoveries of 600, divided equally among the 4 years.

However, accepting the hypothesis of substantial recoveries upon which Table 2-A is based, there is some room for difference of opinion whether or not it would be possible to negotiate the transition and replace the existing coinage with 400 fineness coinage. The arithmetic of Table 2-A implies that the transition might be made. Certainly, no very large margin of safety would exist, particularly since the steady decline in Treasury silver quite possibly would give rise to the need for even larger sales to the market than are allowed for in column (5) of Table 2-A. In any event, the amounts of silver available to the Treasury for use in coinage after the transition would be small, particularly if any allowance for strategic needs were included. On the basis of the projections of Table 2-A, Treasury silver would be gone by 1976 or 1977. After that time, the Treasury would have to buy silver in the market. This would greatly increase the chance that the market price of silver would again eventually be driven to the melting point of subsidiary coinage. It is true that the new melting point in excess of \$3 would provide more leeway for price-induced adjustments in market supply and demand.

A Different Approach

Tables 2 and 2-A are necessarily based upon fairly rigid assumptions and these affect the pattern of decline in Treasury stocks. It would be possible to vary some of these assumptions and note the effect



that this would have on the result. There may also be some value in a slightly different approach. Instead of assuming a certain pattern of recoveries of the old coinage and observing the net effect upon the Treasury silver stock, the example can be turned around in order to show what pattern of recoveries would actually be required to hold the silver stock at any given amount. This is not only convenient in that it allows one to see more clearly what rate of recovery of the old coinage would be required for a successful transition; it also involves a minimum of assumptions, since recoveries of coinage can be treated as a residual.

It will be assumed that replacement of the entire subsidiary coinage is attempted within a 2-year period to minimize the drain on Treasury stocks from holding down the market price of silver, and to reduce the likelihood of coin shortages in the transition period. The rates of coin production required for this rapid replacement would not be possible with existing Mint facilities even if silver strip were purchased. This limitation is ignored in the examples that follow although, in practice, it would be a matter of overriding significance.

The rate at which old coins could be recovered is extremely uncertain and in Tables 3 and 3-A no attempt is made to allocate the recoveries among particular years. This means that the extreme right-hand column of these tables no longer purports to give the actual Treasury silver stock but simply registers what the stock would be without allowance for recoveries of old coin.

Table 3 shows the situation for a 2-year replacement of the existing subsidiary coinage with coinage of 500 fineness, beginning January 1, 1966. Table 3 suggests that fully 500 million ounces of silver would have to be recovered by the end of 1967 to prevent Treasury stocks from falling to zero. If it were somehow possible in the space of the 2-year transition period to recover the entire 1,000 million ounces used in the earlier examples, Treasury stocks would still be reduced to less than 600 million ounces at the end of the transition.

The parallel situation with respect to 400 fineness coinage is presented in the accompanying Table 3-A. This example is based upon the same assumptions as those of Table 3 except for the lower fineness of the new coins. In this case, it would be necessary to recover about 250 million ounces by the end of 1967 to prevent Treasury stocks from falling to zero. The recovery of 1,000 million ounces of silver during the transition period would leave the Treasury with a stock of about 750 million ounces at the end of the transition. However, it is not at all clear how recoveries on this scale could actually be accomplished within a 2-year period.

TABLE 3.—*Example of the Replacement of the Existing Coinage With Coinage to 500 Fineness During a 2-Year Period; No Allowance Made for Recovery of the Old Coinage*

[In millions of fine troy ounces]

Calendar years	Potential amounts of silver used in coinage			Potential amounts of silver used in redeeming silver certificates or in making outright sales to the market	Treasury silver stock at end of period without any allowance for recovery of old coin
	Mint projection of ordinary requirements	To replace 900 fineness coin	Total coinage required		
	(1)	(2)	(3)	(4)	(5)
1964.....	-208.1		-208.1	-150.0	1,200.0
1965.....	-290.9		-290.9	-100.0	809.1
1966.....	-125.0	-444.4	-569.4	-75.0	164.7
1967.....	-64.4	-444.4	-508.8	-100.0	-444.1
1968.....	-63.4		-63.4		
1969.....	-65.7		-65.7		
1970.....	-68.2		-68.2		
1971.....	-70.9		-70.9		
1972.....	-73.7		-73.7		

NOTE.—Column (2) is 5/6 of the 1,600 million ounces of subsidiary coin assumed in circulation, divided equally between the 2 years.

TABLE 3-A.—*Example of the Replacement of the Existing Coinage With Coinage of 400 Fineness During a 2-Year Period, No Allowance Made for Recovery of the Old Coinage*

[In millions of fine troy ounces]

Calendar years	Potential amounts of silver used in coinage			Potential amounts of silver used in redeeming silver certificates or in making outright sales to the market	Treasury silver stock at end of period without any allowance for recovery of old coin
	Mint projection of ordinary requirements	To replace 900 fineness coin	Total coinage required		
	(1)	(2)	(3)	(4)	(5)
1964.....	-208.1		-208.1	-150.0	1,200.0
1965.....	-290.9		-290.9	-100.0	809.1
1966.....	-102.5	-355.6	-458.1	-75.0	276.0
1967.....	-52.8	-355.6	-408.4	-100.0	-232.4
1968.....	-52.0		-52.0		
1969.....	-53.9		-53.9		
1970.....	-55.9		-55.9		
1971.....	-58.1		-58.1		
1972.....	-60.4		-60.4		

NOTE.—Column (2) is 4/9 of the 1,600 million ounces of subsidiary coin assumed in circulation, divided equally between the 2 years.

The example does show that a successful transition to reduced content silver coinage, if possible at all, would require a very short transition coupled with a high rate of recovery of the old coin. In interpreting these examples, it should be kept in mind that the production of



the new coins has been set arbitrarily at required rates, without reference to the fact that such production would exceed Mint capacity. Furthermore, no attention has been paid to the very real possibility of an accelerating speculative demand for silver as Treasury silver stocks declined. It is one thing to construct an example in which Treasury silver stocks fall and are then reconstituted by recoveries of old coin, and quite another thing to estimate just how destructive of confidence a sizable fall in Treasury silver could be during an admittedly hazardous transition to silver coinage of lower content.

### Conclusions

1. The examples that have been presented do not exhaust all the possible ways in which a transition to reduced content silver coinage might be attempted. It is believed that they do cover the more promising alternatives open to the Treasury. The general conclusion must be unmistakable. The transition to silver coinage of reduced content would be an extremely risky undertaking, and Treasury silver stocks would probably be depleted within a relatively short period of time. If there is a partial and limited exception to this overall conclusion, it arises with 400 fineness where a high proportion of the existing coinage is recovered at a rapid rate.

2. Even there the risks would have to be judged intolerably great unless there were clear evidence, at the time a decision was reached, that the coin shortage had ended and subsidiary silver coinage was temporarily redundant.<sup>1</sup> No one could be sure in any case that the price of silver would not be driven again to the melting point of subsidiary coinage; this might not occur within the immediate future. In general, analysis of the special problem of the transition to reduced content silver coinage suggests that attention can appropriately be concentrated from this point in the study upon the base alloy alternatives.

3. However, there may be special reasons for continuing to produce a single silver coin which would circulate alongside the new base alloy coins. This issue is discussed briefly in an appendix to this section.

### Appendix: Notes on the Retention of a Silver 50-Cent Piece

There may be advantages in retaining a single circulating silver coin. It seems reasonably certain that a clad silver 50-cent piece of 400 fineness could be continued in our coinage system for a good number of years, perhaps indefinitely. Furthermore, if for some reason it did become impossible to continue silver in this limited role, a shift to a

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<sup>1</sup> This is clearly not the case at the present time.

base-alloy 50-cent piece could be effected without serious difficulty or disruptive effect.

The amounts of silver which might be used in a clad silver 50-cent piece can be estimated approximately. Between 1957 and 1961, production of 50-cent pieces ranged between 25 and 30 million pieces annually. Since then production has increased sharply, rising to 92 million pieces in 1963 and to 206 million pieces in 1964, when hoarding of Kennedy 50-cent pieces was severe. The more recent levels are, of course, abnormally high. A more reasonable figure might be an annual production of 100 million pieces. This would still be about twice the number of pieces projected by Arthur D. Little for 1968, and it might even be preferable to start with a lower amount initially.

The important consideration, in the present context, is that the production of 100 million 50-cent pieces from the 400 fineness silver alloy would use only some 15 million ounces of silver, about 5 percent of the current rate. This amount would clearly fall within permissible limits of silver usage, particularly since with a transition to base alloy coinage this amount of silver might very possibly be recovered by the Treasury from the existing coinage.

The advantage in retaining a silver 50-cent piece is the extension of a continuous tradition of circulating silver coinage. Of course, sentiment and tradition must not be allowed to obstruct the transition to a secure coinage system, adequate to the needs of the present. However, by eliminating silver from the dime and quarter, a major drain on Treasury silver stocks would have been removed, and the retention of a silver 50-cent piece should be possible.

The retention of one or two silver coins is common practice internationally. Some examples are Japan, France, Italy, the Federal Republic of Germany, the Netherlands, Belgium, and Greece. In continuing with the silver dollar at its existing fineness and a clad silver 50-cent piece of 400 fineness, our own coinage system would come more nearly into corresponding with present practice abroad. As it stands, our own consumption of silver in coinage dwarfs that of the rest of the world and threatens to dislocate silver markets and lead to severe shortages for industrial use.

In suggesting the possible retention of a silver 50-cent piece, it must be stressed that the uncertainties of the future silver situation preclude any definite commitment as to the amounts of 50-cent pieces that would be produced. Also, during early stages of any transition to a new coinage system, the Mint should be concentrating heavily upon the production of the new base-alloy coins. Production of the 400 fine 50-cent pieces should only be phased in gradually as capacity became available and silver supplies were clearly adequate for the purpose. Finally, at the risk of some repetition, it should be emphasized that



the use of any silver whatsoever in the 10- and 25-cent pieces (which are crucial to the needs of commerce in a way that the 50-cent piece is not) is ruled out for the reasons developed earlier.

The feasibility of retaining a 400 fineness silver half dollar should be examined exhaustively by the Treasury before making its legislative recommendations. These notes are only intended to raise the possibility of keeping a silver 50-cent piece, not to provide the full justification that such a course of action would require.

## VI. Further Consideration of the Base Metal Alloys <sup>1</sup>

The previous section has concluded that the transition to a reduced content silver alloy used throughout the subsidiary coinage would be extremely risky and that Treasury stocks of silver would probably be depleted during or soon after the transition period. This negative conclusion applies without reservation in the case of the 500 alloy, and it does not appear that the outlook is much more promising in the case of the 400 alloy. None of the silver alloys of lower fineness than 400 meet minimum standards of acceptability. As noted previously, in the judgment of the Mint technical staff, the exterior silver cladding on any composite coin should not be reduced below 800, and this precludes reducing the overall fineness much below 400. Therefore, the silver alloys are eliminated as the basic subsidiary coinage material. The possibility remains of using very limited amounts of silver in a clad 50-cent piece, but the bulk of future subsidiary coinage production must be nonsilver. The present section will consider the advantages and disadvantages of the base alloys that remain and discuss the ways in which the transition from the present silver coinage to a new system largely of base alloy coinage could best be attempted.

### Relative Merits of the Remaining Alloys

There are four remaining alloys: Cupronickel, nickel silver, cupronickel or nickel silver clad on a copper core, and the Inco coin. No final choice will be made from among them at this stage, but their respective advantages and disadvantages will be summarized and a tentative judgment established. At an early stage of this study, criteria were developed against which it was suggested that a future coin program might be judged. It will be helpful now to compare the extent to which the remaining alloys do successfully meet the different criteria.

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<sup>1</sup> This chapter was written before the Mint had completed its intensive investigation of the clad coinage materials with respect to production feasibility and an assured supply of the bonded strip. Consequently, it does not fully reflect information available to the Mint and Treasury at the time the eventual coinage decision was made. This fact should be borne in mind in reading the present chapter and in interpreting the study's final conclusions and recommendations.



## **Medium of Exchange Function and Permanence of the Solution**

Any of these base alloys would appear to meet the essential requirement of no interruption to the essential medium of exchange function, although specific changeover problems with the alloys remain to be discussed. Any of the alloys would also appear to meet the requirement that there be a minimal chance of any serious disruption to the new coinage system within the next 20 to 25 years.

### **Assured Access to Raw Materials**

On the question of assured access to raw materials, the Inco coin does present potential problems. As noted earlier, nickel does not seem likely to present a really critical overall supply situation. But the fact remains that U.S. production of ferronickel is unsuitable for coinage, and U.S. coinage requirements would have to be met from the existing stockpile of nickel and/or Canadian production. In addition to the overall nickel supply picture, the special nature of the production process with the Inco coin means that for a considerable period of time the Mint would be largely dependent upon a single commercial source of supply for the alloy itself. In order to achieve a rapid transition to high level of production, it would apparently also be necessary to have annealing and blanking operations carried on by Inco at its Huntington, West Virginia, plant.

Provision could possibly be made subsequently to carry on all or some of these operations in the new Philadelphia Mint or perhaps to look to a later transition to a pure nickel coin and plan the new Philadelphia Mint facilities accordingly. All of this adds uncertainties and complications at a time when planning for future Mint operations is difficult enough. These considerations and those of raw material supply should not entirely rule out the Inco coin, but they do suggest that it must offer some clear advantages over the other alloys to compensate for its less than ideal position from the point of view of supply.

### **Public Acceptability**

Public acceptability of a new coinage system was viewed as resting upon a number of factors among which were demonstrated necessity of the need for a change to the new system, physical characteristics of the new coins, minimum of inconvenience to the public, and absence of extreme hardship to a particular group or industry. The first of these factors, the need for the change, applies equally with all of the alloys. The physical characteristics of different coinage materials were discussed in some detail in Section IV when these four base alloys were selected from a larger number of potential alloys.

## Physical Characteristics of the Coins

Aside from questions of operation in vending machines, it can be argued that on the basis of their physical characteristics the coins should be ranked: Inco, cupronickel or nickel silver, and the clad coins. Such a ranking would be based upon the belief that nickel is a slightly more desirable coinage metal than cupronickel or nickel silver and that clad coins are generally not quite so desirable as conventional alloys. However, extensive Mint testing of the clad materials has revealed that their wear properties and other physical characteristics are in no way inferior to homogeneous alloys made from the outside cladding material. The reddened edge of the clad coins is a matter of appearance on which opinions might possibly differ. So long as the coins are durable, attractive, and perform the medium of exchange function, the reddened edge would not appear to be a matter of very great importance.

## Operation in Vending Machines

Public acceptability will also depend upon the new coins working in vending machines. The strong point claimed for the Inco coin is its ability to work in existing vending machine rejectors. In some machines, the application of a small piece of tape has improved performance. As noted previously, the claims made for the Inco coin have never been demonstrated convincingly, despite repeated tests. There is reason to believe that all of the problems have not yet been overcome, and may never be. The case for the Inco coin does rest primarily upon its consistently successful operation in vending machines under actual operating conditions. Consequently, the failure of the Inco coin to demonstrate its compatibility with the existing silver coinage in vending machines is very nearly a decisive objection to its use. Inco claims that an entirely new type of rejector mechanism, based upon electronic principles, might be designed around their coin. No such equipment exists, and even if it did, it would not meet the immediate problem.

The cupronickel clad coins have, on the other hand, conclusively demonstrated their ability to work alongside the existing silver coins in the 10-, 25-, and 50-cent channels of existing vending machines. Similarly, the silver-copper alloy clad on a low-content silver core, which has been suggested for use in the 50-cent piece, would work in vending machines with no alterations required. Nickel silver clad on a copper core has not been tested in vending machines, but on the basis of its physical characteristics it would work. A possibility, in the case of the base-alloy-clad materials, would be to use one or the other of them as a transitional coin while vending machine rejectors



were being modified or replaced to accept ordinary cupronickel or nickel silver coins.

The relative importance of compatibility of the new coinage and the present coinage in vending machines will be discussed further in the context of changeover problems. To this point, major emphasis has been placed upon the inconvenience to the public if new coins will not work in vending machines and the possibly disruptive effects upon the vending machine and coin rejector industries. In addition, large companies whose products are nationally distributed through vending machines would understandably be concerned in such a case. These are very important considerations that should be weighed carefully before reaching any final decision—particularly the inconvenience to the public and possible disruption of commerce. It should also be pointed out that under conceivable circumstances the effort to insure that new coins would work immediately in every vending machine could come into conflict with the more important objective of insuring an adequate supply of coins at all times. This could be the case if the compatible coinage material were not available quickly in needed volume. Since this is a matter which the Mint is investigating intensively, it need not be considered further here.

### **Absence of Hardship**

The absence of serious hardship to any single group or industry is a reasonable objective, whichever one of the base alloys is selected for the subsidiary coinage material. As noted above, this suggests the desirability, if not the absolute necessity, of finding a coin which will work in existing vending machines, or possibly offering some assistance to the vending machine industry if such a coin is not used. The needs of the silver users will be met if silver is removed from the coinage—except for the relatively small overall requirements if silver clad is used in the 50-cent piece—and the price of silver is held at the present level during a fairly lengthy transition period. Silver producers might reasonably be protected by a proposal that the Treasury would stand ready to buy newly mined domestic silver—say at \$1.25+—for a period of time. In the absence of such a purchase program, producers might fear the market-depressing impact of the liquidation of speculative stocks of silver, accumulated in the mistaken belief that the price of silver was sure to rise above \$1.29+.

### **Ease and Certainty of Production**

Ease and certainty of high levels of coin production are extremely important; they could become a vital consideration in the case of a quick changeover. It is clear that cupronickel has many advantages

here because of long Mint experience with the material and dependable commercial sources of cupronickel strip. Nickel silver is also a relatively easy material for the Mint to work with; as noted earlier the addition of zinc does complicate melting procedures to some extent. But, nickel silver strip should be readily available from commercial suppliers.

Both the Inco coin and the clad coins offer potential difficulties, although in the case of clad coins the difficulties quite possibly can be resolved. The Inco coin will be hard on dies and may require heavier presses. This assumes that annealed blanks would be supplied by Inco, but certainty of supply cannot be absolutely assured in such an event. Unless the Mint could build up very large inventories of the blanks, which would hardly be possible at first, there would be the threat that a strike at Inco, a failure in quality control, or some other temporary interruption to the steady flow of acceptable blanks could disrupt Mint production schedules. With the clad coins, there is little question of the Mint's ability to work the material. But, assurance of an adequate supply of the clad strip is uncertain on the basis of what was known at the time this report was written. This uncertainty will be resolved by intensive Mint investigations currently underway.

### **Minimization of Cost of Coinage**

The minimization of the cost of coinage is a sensible objective only at an acceptable level of coinage quality. Cupronickel would probably offer the most seigniorage. Nickel silver should run a close second with some increase in cost because of the need for special procedures where zinc is alloyed with copper and nickel. The exact cost per pound of clad strip has not yet been determined. Approximate information is available, and suggests that the cost of clad cupronickel strip would initially be in the range of \$1 to \$1.50 per pound.

Cupronickel alloy costs about 45 cents a pound and only a further 5 cents, or so, need be added in the case of the homogeneous alloy for melting and rolling operations performed in the Mint. Where the strip is purchased from outside suppliers, the comparable cost would be about 65 cents per pound. The cost of cupronickel clad on a copper core would fall in the range of \$1 to \$1.50 per pound, assuming the same 45-cent cost of alloy. The Inco strip would probably cost about \$1.50 per pound. In view of the relatively large amount of seigniorage with any of these materials and the general importance of the coinage, it could be argued that alloy cost should not be given very much weight in the final decision. It probably should receive some consideration.

One type of cost calculation which may be relevant is the extra cost of clad strip, or the Inco coin, over straight cupronickel or nickel



silver. Since the clad coins are chiefly attractive because they will work in existing vending machines, their extra cost, if they are used permanently, should be contrasted with the once-and-for-all cost of altering vending machine rejectors. Where clad coins were used only during a transition period, the extra cost could be viewed as necessary to achieve speedy introduction of the new coins. But, if clad coins are used permanently, cost more than conventional alloys, and are superior in no respect other than use in vending machines, a question arises whether eventual modification of rejectors to accept conventional alloys might not prove desirable.

With the clad coins, the increment paid (in the first instance by the Mint and ultimately by the public) in lieu of altering vending machines is probably on the order of 50 cents to \$1 per pound of coinage material, and about \$1 in the case of the Inco coin. The extra cost in the case of cupronickel-clad coins might be \$10 to \$15 million annually at high rates of coin production, and reduced proportionately at lower rates of production. This extra continuing cost contrasts with a one-time vending machine conversion cost that might range from \$50 to \$100 million if a straight cupronickel or nickel silver coin were to be used. The use of either of these coinage materials would also, in the opinion of the vending machine industry, involve intolerable continuing costs because the selectivity of their rejectors would be so greatly impaired that they would accept a wide variety of slugs and foreign coins. In addition, there would be losses because of "downtime" while rejectors were being modified. These losses are difficult to quantify, but could be considerable.

Cost comparisons of the sort described here while of some relevance could not be a decisive factor, even if plausible magnitudes could be assigned to them. They cannot measure the inconvenience to the public and the attendant disruption to commerce that might follow a decision to introduce large amounts of coin into circulation which would not be compatible with the present coinage in vending machines.

### **Balance of Payments Cost**

Alternative base alloy programs would not have an appreciably different effect upon the balance of payments, except for the Inco coin. There, unless nickel were used from the stockpile, imports of nickel from Canada would increase, possibly by \$10 to \$20 million annually.

Other possible effects upon the U.S. international position are less tangible and very difficult to estimate. Advocates of silver in the coinage will stress the importance of its retention and cite the return to some silver in coinage by Western European countries. The retention of the present silver dollar and the use of the 400 fineness clad alloy in the 50-cent piece would seem to meet the requirements of prestige.

### Summary: The Relative Merits of the Base Alloys

The choice between cupronickel and nickel silver on the one hand and between the Inco coin and clad coins on the other is best considered separately. Cupronickel and nickel silver are "permanent" coinage alloys; they will not work as subsidiary coinage in existing vending machines. The Inco and clad coins can be regarded as "transitional" coins which will work in vending machines while rejectors are being altered for a permanent coinage of pure nickel, cupronickel, or nickel silver; or equally well, they may be regarded as permanent coins if it is determined that modification of vending machine rejectors is not desirable. It will be assumed, simply for the purpose of discussion, that eventual modification of rejector mechanisms may be contemplated.

Assuming that vending machine rejectors were to be modified eventually, the choice of permanent coinage materials lies primarily between cupronickel and nickel silver. The transition to pure nickel coinage appears to be impractically difficult since, as indicated in Section IV, it would mean the replacement of practically every coin testing device currently in use. As between cupronickel and nickel silver, the differences are not great, although in most respects cupronickel is a slightly superior coinage material. Some people feel that nickel-silver makes a slightly better looking coin, *i.e.*, more like silver, when newly minted. But, this is probably more than offset by its tendency to yellow with age and its general inferiority to cupronickel from the Mint standpoint. The upgrading of the 5-cent coin material that would occur with cupronickel would, perhaps, not be an ideal solution, nor is it an altogether attractive prospect to have 5- and 10-cent pieces of present size made from the same material. However, all things considered, the preference here would be slightly in favor of subsidiary coinage made from cupronickel, with the present 5-cent piece unchanged. The alternative of leaving the present 5-cent piece unchanged and using nickel silver for the subsidiary coinage would also be acceptable.

The cupronickel or nickel silver clad on a copper core has the great advantage of avoiding the need for modification of vending machines. The Inco coin does not work acceptably and even if it did it would be superior to the clads only on the basis of appearance. The clad coin is to be preferred since it would lead logically and easily to a permanent coinage of cupronickel, or nickel silver, or, as seems equally desirable, could be retained as the permanent coinage material.

### Changeover Problems with the Base Alloys

While the announcement of a plan to switch to a base alloy for subsidiary coinage is not likely to cause intensified hoarding of silver



coins by the public, the Mint must be prepared to offset any conceivable scale of withdrawals. Similar considerations would apply in the case of reduced content silver coinage, and it will be recalled that some of the arithmetic examples in Section V allowed for complete replacement of the coinage in circulation at the time of the change-over, whether or not the old coins could be recovered. Most of those not recovered were assumed to have been hoarded. A crucial difference is that the prospect of a sharp increase in silver prices would disappear, and the major threat to a smooth transition would be removed.

However, the public may want to hold relatively large amounts of silver coins; new ones because they are the last of their kind, old ones because of enhanced numismatic value, real or imagined. This could mean that a large part of the production of 1964 silver coins might fairly rapidly, if temporarily, be withdrawn from circulation along with an appreciable amount of older coins. The effective countermeasure is a very high rate of production of the new coins and their introduction in large volume. If a silver 50-cent piece is continued in production, the withdrawal of silver coins may well be minimized.

### **Possible Need To Replace Existing Coinage**

The net effect of these considerations is that, while side-by-side circulation of the new and old coins is altogether likely, there are residual uncertainties and the prudent course is to be prepared to replace the coinage fairly rapidly, if required. The "replacement problem" with a base alloy is very difficult from the case of a transition to silver coinage of reduced content. In that case, the situation was complicated by the need to recover as much as possible of the existing coinage and turn it out again in the form of lower content coins. With the change-over to base alloy coinage, the problem is inherently a much simpler one of rapidly achieving a rate of production sufficient to offset withdrawals from circulation. Because the rate of withdrawal of the old silver coins is difficult to estimate in advance with accuracy, the Treasury must plan to replace much of the existing coinage and have the capability to do it within a relatively short period of time. If the coin shortage should ease by early next year, the changeover problem should be a relatively simple one. At the present time, planning should go forward on the less favorable assumption that there will still be a coin shortage at the period of peak demand in the second half of 1965.

### Possible Interim Expansion of 5-Cent Production

Assuming for the sake of discussion that legislation providing for a new base alloy coinage were passed by late spring or early summer, only a limited amount of the new coins could be produced by the end of the calendar year, and their introduction should probably be delayed until 1966. At the same time, the public might possibly be making some net withdrawals of silver coin from circulation. This could contribute to a tight coinage situation next year at about this time (December). One step that can be taken even before the legislative consideration of the Treasury proposals is to plan for extra production of 5-cent pieces beyond the amounts scheduled under the current crash coinage program. The logic of such a procedure would be that whatever the eventual decision on the subsidiary coinage material, extra 5-cent pieces would be a valuable addition to the circulating coinage during the difficult initial stages to the changeover.<sup>1</sup>

If it were considered certain that silver would not be continued in the coinage, there might even be something to be said for a reduction in the rate of silver coinage after the beginning of the year. To the extent that this allowed increases in the rate of coinage of 5-cent pieces, coins which would stay in circulation would be increased at the expense of coins which possibly might not to the same degree. There are, however, difficulties with such an approach. A much larger number of 1- and 5-cent pieces must be produced to carry on a given dollar amount of commercial transactions. Furthermore, such a shift might cause some disruption in Mint production schedules. For these reasons, it probably is better to plan to continue to produce silver coins at fairly high levels up to the time that a switchover is made to a new subsidiary coinage alloy.

This would not, however, preclude some intensification of the production effort next year on 5-cent pieces, at the expense of 1-cent pieces. It is understood that the Mint will have considerable flexibility in this respect as new presses already on order are delivered. A further but more far-reaching effort along these lines would be the establishment of additional temporary facilities which could be used to produce cupronickel 5-cent pieces from purchased strip and rapidly shifted to the production of subsidiary coinage at a later time in the year.

Possibilities of this sort have been canvassed thoroughly on earlier occasions when planning the current crash coinage program. Great progress has been made along these lines. Approximately 50 coin stamping presses and additional blank annealing and cleaning lines

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<sup>1</sup> As is now amply clear (May 1965), the Mint's crash coinage program has been eminently successful in overcoming the shortage of 1-cent and 5-cent pieces and has built up the sort of backlog referred to in the text.



are on order, and it is understood that further 10-coin stamping presses are about to be contracted for. However, the changeover to a new coinage alloy may mean that even higher levels of coin producing capacity will be required until the new Philadelphia Mint comes on stream. If so, there probably is a need to reexamine the possibility of seeking authorization to obtain additional space where supplementary minting of coins from purchased strip could take place. This might involve the installation of coin-stamping presses in the present San Francisco building, or in temporary facilities elsewhere, or both. In any event, "outside" operations should remain under Mint control and jurisdiction.<sup>1</sup>

### Dimensions of the Changeover Problem

Some rough idea of the production effort that might be required to insure an efficient changeover to base alloy coinage can be gained by reference to the volume of subsidiary coin estimated to be in circulation at the time of the changeover. Table 1 presents approximate estimates of the number of pieces of subsidiary coin that will be in circulation at the end of calendar year 1965 and their face value. These estimates supplied by the Mint are lower than those that would be carried in the *Circulation Statement*, but higher than those implied by the A. D. Little estimates for January 1963 based upon the age distribution of a selective sampling of coins by the Federal Reserve banks. Further internal studies of the amount of coin in circulation should probably be made by the Treasury, but the present estimates are adequate for the purpose at hand.

One dimension of the changeover problem is simply the total amount of base alloy coins that would have to be produced in order to replace silver coins now in circulation. There is every reason to believe that there will be extensive side-by-side circulation of silver and base alloy coins. However, to be entirely secure, plans should be made for the full replacement of the existing coinage. Another dimension of the changeover problem is the peakload production that will be required in early stages of the changeover when withdrawals of old coin would possibly present a problem. Complete replacement of the more than 12 billion pieces of outstanding subsidiary coinage with base-alloy coinage would probably take about 3 years. This assumes that 1- and 5-cent production would be continued at roughly the rates now scheduled for fiscal 1966 and that the remainder of Mint facilities would be shifted as rapidly as possible to the production of base-alloy coins with the maximum feasible reliance upon the purchase of strip. Replacement could be accomplished even more rapidly, if existing and planned capacity were to be expanded.

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<sup>1</sup> The Treasury's proposed legislation includes authorization to resume the minting of coins at the San Francisco Mint.

TABLE 1.—*Estimated Subsidiary Coin in Circulation at End of Calendar 1956*

	Pieces (in millions)	Value (in millions of dollars)
50-cent.....	1,233	\$616
25-cent.....	3,317	829
10-cent.....	7,844	784
	12,394	2,229

Source: Bureau of the Mint.

Full replacement of the existing coinage is hardly likely to be obligatory within 3 years, but this does set an approximate upper limit on the overall production task. What does seem likely to be required is the ability to reach peak rates of production very quickly in order to offset any net withdrawals of old coin in initial stages of the transition. This does tend somewhat to increase the attractiveness of cupronickel as the subsidiary coinage material since the Mint is thoroughly familiar with its processing, no period of experimentation would be required, and dependence upon outside suppliers would be minimal.

Purely for the sake of illustration it may be useful to consider the timing of a shift to cupronickel subsidiary coinage. At the time of writing, it is not possible to evaluate a similar changeover to cupronickel clad coin, but the Mint is examining the problem in depth and detail. In the case of straight cupronickel, if the Mint were able to commence full-scale production of subsidiary coins by July 1 of next year, it might be possible to produce as many as 1.9 billion pieces by the end of the calendar year. The maximum annual production rate would be 3.8 billion pieces of cupronickel subsidiary coin with existing production facilities and approximately the existing distribution among 1-cent, 5-cent, and subsidiary coin production. If this maximum rate could be quickly achieved, a little more than 15 percent of the outstanding amount of subsidiary coinage could be replaced in the first 6 months. If the coin shortage eases early next year, this rate of replacement of subsidiary coin should be entirely adequate. Still, there is much to be said for an immediate effort to provide an even larger temporary productive capacity, and if there is continuing evidence next year of a coin shortage, some action will be obligatory. The leadtimes for expansion in coin-producing capacity are long, and deliveries of needed equipment and materials are sometimes uncertain. However, the Mint's efforts under the crash coinage program have been prodigious, and, if required, they undoubtedly can expand their capacity even further.



## Vending Machines and the Changeover

The possible need for very intensive production of the new coins is complicated by the vending machine problem. Where the new coinage material did not work in present rejectors, there would be two extreme alternative courses of action. In one the vending machine constraint would be accepted and coin production would be adapted accordingly. Production of silver coins would be continued at high rates while vending machines were being modified and parallel production of the new coins was begun, but the introduction of new coins would be delayed until vending machines were fixed. The objections to such a program are obvious. Even if vending machines could be altered in less than 2 years, the drain on silver stocks during that time could be very great. Furthermore, it would be extremely difficult to arrange for the parallel production efforts on old and new coins without running the risks of a divided effort and inadequate production of both.

The other alternative would be to commence production of the new coins as soon and as rapidly as possible and place them in circulation without awaiting the modification of vending machines. This would have the advantage of not continuing the production of silver coins at a time when many of them would go out of circulation as soon as they were issued. The obvious disadvantage would be the fact that new coins would not work in unaltered vending machines. While this should, in fact, tend to keep some additional amounts of old coin in use, it could hardly fail to disrupt machine merchandising and greatly inconvenience the public. In early stages of the transition, new coins would still be a small fraction of the total amount of coin outstanding. If vending machines could be altered rapidly, and their operators would have some incentive to do so, the changeover might be achieved without dire results. Whether such a program could gain legislative approval, or should be recommended, is another question entirely which will not be examined here.

## The Transitional Coins

The obvious attractiveness of the clad and Inco coins, is the potential they offer for avoiding the vending machine problem. Introduction of the new coins into circulation could proceed as rapidly as they could be produced. The critical factor then tends to become the leadtime required to obtain adequate amounts of the Mint input—clad strip or annealed Inco blanks. While successful resolution of vending machine difficulties is highly desirable, it will be necessary to guard against attaching too much importance to that single objective. The supply of the material for the transitional coin must be completely assured. Otherwise, there is a danger that a high rate

of production could not be sustained. This could potentially even be more serious in its overall effects than the difficulty with vending machines that would result if ordinary cupronickel coins were used.

Inco apparently has the capacity to make the required amounts of strip but the Mint would need annealed blanks at least initially. Even if the Inco coin were satisfactory in other respects, assurance would be needed that adequate amounts of blanks would be forthcoming, and that they could be struck on existing Mint equipment. Similar considerations apply in the case of clad strip upon which the details of assured sources of supply were not available at the time of writing. Battelle has recommended that the Mint initiate an exhaustive investigation on this crucial point and just such an investigation is underway.

### **Melting, Hoarding, and Export Controls**

Brief comment will be made on the role that melting, hoarding, and export controls might play during the changeover to a base alloy, although full examination and analysis of the problem will not be attempted here. It may be desirable to obtain standby authority for the Secretary of the Treasury to institute controls over the hoarding, melting, and exporting of silver in the event he determines certain conditions occur. But, with the possible exception of export controls, the usefulness of such controls as part of an orderly changeover appears questionable; rather, their function would appear to be that of emergency maneuvers to be taken only if the possibility of holding the silver price through sales from our own stock during the critical changeover period is seriously threatened. If the changeover is started soon to a base alloy, this threat will undoubtedly be avoided.

The purpose to be served by controls over the melting of coin if the Treasury is able and willing to hold down the price of silver is questionable, since there would then be no incentive to melt coins. Furthermore, the prohibition of melting at the same time as the price of silver is being held could foster the misconception that the price was shortly going to be allowed to rise, and stimulate speculation in bullion.

Melting controls might be obligatory in a "last ditch" effort to maintain coin in circulation where the Treasury had tried to hold the price of silver, but then ran out of silver which could be sold in the market. In general, this would not even seem to be a remote possibility where the transition is to a base alloy, rather than to a reduced content silver alloy. Moreover, while melting controls could be required under some circumstances, too much should not be expected from their application, since a prohibition on melting could not effectively prevent hoarding under those circumstances.



Controls over the hoarding of coin, while perhaps conceivable in theory, would be extremely difficult to enforce effectively. It is hard to see just how controls could be designed which would discriminate successfully between prohibited hoarding and the accumulation of coin in the ordinary course of business, and in coin collections. Possibly, penalties for coin hoarding could be devised that would limit large accumulations by professional speculators, and such controls might play some part in effecting the recovery of old silver coin in the transition to silver coinage of reduced content. Even this seems doubtful, however, since a legal apparatus effective in dissipating large hoards would seem almost certain to encourage even more widespread "family" accumulations. While the question deserves fuller discussion and analysis than it will be given here, there does not seem to be much value in controls on the hoarding of coin. Controls on the hoarding of bullion might conceivably be more effective.

There is a stronger case for export controls during a changeover period. Certainly, they would be an essential backstop to any controls over the melting or hoarding of coin. But if these controls are not used because the Treasury is holding the market price of silver, the case for export controls on silver is much less clear.

The only situation in which we would want to prohibit the export of silver bullion would be during a period when there was heavy foreign speculative demand, which added to the drains on Treasury stock—as was the case temporarily in the latter months of 1964. However, one result of applying export controls would be a partial separation of the U.S. market from the world market, and there would be some increase in world prices above the pegged U.S. price. As a consequence, some U.S. domestic demand for silver, previously met from imports, would now be met from Treasury stocks, a cheaper source of supply. By frustrating the foreign demand for Treasury silver, it could be argued that some net saving would arise. It should be recognized that silver users would probably regard the separation of U.S. and world markets as a threat to their assured sources of supply. If so, export controls might stimulate silver users to make precautionary purchases of Treasury silver in advance of their current requirements. The fact that, aside from speculative demands, the United States is a natural importer greatly increases the possibility of this response to a higher world price.

## VII. Conclusions and Recommendations

1. Cupronickel is the best permanent material for a new subsidiary coinage, ignoring the vending machine problem. A close second choice would be nickel silver for 10-, 25-, and 50-cent pieces.

2. Either cupronickel or nickel silver coins would require "factory" adjustment of sophisticated vending machine rejectors, entailing significant costs and transitional inconvenience. This may not be adjudged intolerable, in view of their advantages in other respects. However, since extensive experiments confirm that cupronickel (and probably nickel silver) clad on a copper core operates successfully in unaltered vending machine rejectors, preferable options are available. A clad coin can be used during a transition period, or permanently.

3. Information on the wear properties of clad coins is altogether encouraging, and they undoubtedly meet all the requirements for permanent use in the coinage. If desired, they could, with equal facility, serve as a transitional coin while further study and research on the adaptation of vending machines was being conducted. An overriding requirement with clad coins is the production feasibility of the strip and the assurance of an adequate supply for processing in the Mint.

4. Because of a number of unresolved questions, the Inco coin comes into the picture only if an assured supply of clad strip cannot be obtained. In any event, the Inco coin would have to have demonstrated conclusively that it would work in vending machines with minimal adjustments, that it could be struck successfully in large volume on existing Mint equipment, and that adequate supplies of strip or annealed blanks would be available.

5. Subsidiary silver coinage of reduced content, such as silver-copper alloys clad on a low-content silver-copper core, suffers both from difficult transitional problems and incomplete assurance that the subsidiary coinage would not be imperiled again within a fairly short period of time. The danger of a complete breakdown during the transition period cannot be ruled out, and the use of silver throughout the subsidiary coinage should not be viewed as an eligible option. If any silver is to be retained in the subsidiary coinage system, it should be limited to the silver dollar and to a clad 50-cent piece of 400 fineness. In any event, the retention of the monetary value of the silver dollar at its present fineness is absolutely essential to a successful transition.



6. During the transition to a new coinage system, it will be obligatory to hold the market price of silver at its current level in order to protect the existing coinage. Since this will remove the incentive to melt the existing coinage, controls over melting would probably not serve any useful purpose. Effective controls on the hoarding of coin appear impractical. Controls on the export of silver coin and bullion may serve a useful purpose during the transition period. There is something to be said for having standby authority to invoke controls. A prompt transition to base-alloy coinage would make the actual use of controls unnecessary.

7. New coins should be placed in circulation through normal channels. Every effort should be made as soon as possible to prepare for extremely high rates of production of the new coins. This should include an interim expansion in the production of 5-cent pieces (which would provide substitutes for silver coin and subsequently release Mint capacity for the new coins) and arrangements for additional temporary production space. If this were to be outside of existing Mint facilities, it should remain under Mint control.





FINAL REPORT

on

A STUDY OF ALLOYS SUITABLE FOR  
USE AS UNITED STATES COINAGE

to

U. S. DEPARTMENT OF THE TREASURY  
BUREAU OF THE MINT

February 12, 1965

by

BATTELLE MEMORIAL INSTITUTE  
505 King Avenue  
Columbus, Ohio 43201

# Battelle Memorial Institute • COLUMBUS LABORATORIES

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February 12, 1965

Miss Eva Adams  
Director of the Mint  
U. S. Treasury Department  
Washington 25, D. C.

Dear Miss Adams:

We are pleased to submit herewith 200 copies of our Final Report on "A Study of Alloys Suitable for Use as United States Coinage".

As the report indicates, no single material was found which could entirely satisfy all the criteria, both the subjective and objective ones. We believe, however, that the recommended alternatives represent satisfactory compromises that consider the many criteria and points of view brought to light by our investigation.

The other Battelle staff members join me in expressing thanks for the opportunity we have been given to work on this project. We have enjoyed working with you and your staff, as well as other members of the Treasury Department staff.

Please call upon us if we can be of additional assistance at any time.

Very truly yours,



H. J. Wagner  
Associate Chief  
Ferrous and High-Alloy  
Metallurgy Division

HJW:lh  
Enc. (200)

D E D I C A T E D   T O   T H E   A D V A N C E M E N T   O F   S C I E N C E



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The contributions and cooperation received from the various metal producers, fabricators, silver consumers, silver producers, coin-selector manufacturers, and the operators of coin-activated machines are gratefully acknowledged.

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A STUDY OF ALLOYS SUITABLE FOR  
USE AS UNITED STATES COINAGE

by

L. P. Rice, M. E. Emerson, H. J. Wagner,  
R. W. Hale, and A. M. HallSUMMARY

This report contains the results of a study of materials that could be considered as alternatives to the present 90 silver-10 copper alloy used in United States coinage. Evaluation of candidate materials was made on the basis of the following criteria:

- Availability and Price
- Public acceptability
- Physical, chemical, and mechanical properties
- Effect on coin-operated devices
- Effect on mint operations
- Counterfeiting, illegal duplication, and slugging potential.

Included in these criteria were considerations of the supply and demand picture from the present time to the year 2000 for silver and various base metals.

No material can entirely satisfy all the criteria, though certain materials are outstanding in one respect or another. For example, the present silver-copper alloy is excellent in every respect except that it does not satisfy the availability and price criterion. The study indicates that the Treasury silver stocks will be depleted in 3 to 8 years (depending on the demand for coinage) if the current alloy is continued. It is judged that a limit of about 15 per cent should be placed on the silver content of the coinage material, so that the Treasury stocks can be maintained for a long enough period of time to serve as a means of preventing a rise in the price of silver.

Cupronickel (75 copper-25 nickel) is attractive from the standpoint of the transition to the new coinage, because of the ease with which it could be adapted to Mint operations. However, it would not be completely acceptable in coin-operated devices.

One acceptable solution, though not satisfying every criterion to the fullest extent desired, would be the use of a composite material. One such material is a sandwich-like combination that combines into outside layers, elements of appearance and, in its core, physical properties that make the composite completely compatible with present coinage alloys in coin-operated devices.

It is recommended that a composite material be adopted consisting of a 75 copper-25 nickel alloy on the outside and a core of copper. It is also recommended that the Mint take whatever steps are required to establish the availability of the material and the feasibility of maintaining quality control under mass-production conditions.

If the multilayer composite should be disqualified for unforeseen reasons, it is recommended that the new coins be made from the homogeneous 75 copper-25 nickel alloy.

If the retention of silver because of tradition and prestige does not compromise any of the other objectives, it is recommended that either of two options be chosen. One is to use silver in the 50-cent piece only, by making a multilayer composite consisting of 80 silver-20 copper on the outside, and a low silver-copper alloy in the core. The other option is to spread the silver evenly throughout all subsidiary denominations by making a composite consisting of the 40 silver-50 copper-5 nickel-5 zinc alloy on a silver-bearing copper alloy core. It is further recommended that the silver-containing coins, if adopted, be changed to the 75 copper-25 nickel on a copper core on July 1, 1975, or at such time as the Treasury stock of silver reaches a predetermined minimum.



A STUDY OF ALLOYS SUITABLE FOR  
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L. P. Rice, M. E. Emerson, H. J. Wagner,  
R. W. Hale, and A. M. Hall

INTRODUCTION

During the past few years, the Treasury of the United States has watched with growing concern the increasing rate of consumption of its silver stocks, its principal source of silver for coinage. The concern arises from the fact that the amount of silver used for minting subsidiary coinage (dimes, quarters, and half dollars) has been increasing so rapidly that there is danger that the supply of silver from the Treasury stocks and mine production will soon not be adequate to fulfill the combined needs for coinage, industry, and defense.

Because of the imbalance in supply and demand, the possibility has been considered of changing the present silver coinage alloy, set by Congress at 90 per cent silver - 10 per cent copper. As one facet of its investigation of the situation, the Treasury Department, Bureau of the Mint, engaged Battelle Memorial Institute to make a study of coinage materials.

The purpose of this study was to examine the silver supply and demand picture, identify and evaluate various possible substitutes for the present alloy, and to recommend the most suitable alternative on the basis of available facts, reasonable estimates, and engineering judgment. This study did not delve deeply into the political or economic consequences of a change from our present silver coinage to some other alloy, except where such effects are closely related to the choice of a particular metal or alloy.

There is general agreement among members of the Treasury Department, silver producers, silver consumers, and economists that the available Treasury stocks of silver for coinage will be depleted in the not-too-distant future. The area of disagreement is in the length of time for depletion to be complete, and in the best solution to the problem.

A great number of solutions have been offered since the problem was first brought to light. Most of these suggestions are based on metallic coinage and include suggestions both for lowering the silver content of the present alloy and for eliminating silver entirely. However, suggestions have also been offered for nonmetallic coinage materials, such as plastics and ceramics.

In an effort to obtain a balanced perspective of possible approaches to this problem, a broad spectrum of metals, alloys, and nonmetallic materials that might be used for coinage is considered and evaluated in this report.

The substitution of a new silver-free alloy, or even a small change in the silver content of our coinage alloy, presents many problems which are at once complex and controversial. This will be understood by noting the following criteria that have been taken into account in judging the suitability of various candidate metals, alloys, or nonmetallic materials:

- Availability and price
- Public acceptability
- Physical, chemical, and mechanical properties
- Effect on coin-operated devices
- Effect on Mint operations
- Counterfeiting, illegal duplication, and slugging potential.

These criteria are discussed in detail in the next section of this report.



CRITERIA FOR SELECTING ALTERNATIVE  
COINAGE MATERIALS

A number of criteria for rating candidate materials are listed below and discussed in some detail. It is believed that all of the important factors governing the choice of a coinage alloy are included.

Availability and Price

The primary reason for the present predicament in silver coinage is the increasing price and decreasing Treasury supply of silver. It is most important, therefore, that the recommended alternative be available at reasonable price and in sufficient quantities for many years to come.

Price and availability depend on a number of factors, such as geographic location of the sources of supply, present usage and estimated future trends in usage, number of suppliers, and Government stockpiles for defense purposes. From the standpoint of international politics and economics, it would be best for the sources of supply to be in the United States. Barring this possibility, however, it would be preferable that the supply of raw material be available in the needed quantities on the North American continent. Under all but the most extraordinary circumstances, this would insure the Treasury of an adequate supply should imports be interrupted or cut off.

A description of the present and future supply-and-demand picture for selected candidate materials is found in Appendix A.

Public Acceptability

Judging from the widespread attention paid to the current problem in the public press, and the feelings expressed by members of Congress and other Government officials, the reaction of the public to a change in coinage materials is a most important factor. Acceptability to the public, however, is a subjective criterion which is not measurable by any simple scientific test or series of tests. If sufficient time were available, a public poll using carefully chosen sampling techniques might provide some measure of public acceptability for a new coinage material. In the present report, the evaluation of various materials from this viewpoint is based on judgments of the reasons for public acceptance or rejection of certain materials.

Public acceptability, it is believed, is related to a number of more easily recognized factors. For example, experience with genuine coins has enabled the public to distinguish genuine coins from counterfeit ones on the basis of such factors as color, weight, brittleness, bounce, and ring. It would seem prudent, from this viewpoint, to select substitute materials that are in some way unique, so that the public can easily distinguish between genuine and counterfeit coins. It is quite likely that a coin which cannot be "trusted" would not be acceptable. An unknown factor, in assessing acceptability, is whether the public would prefer a coin that was close to the present coinage

in color, weight, bounce, ring, etc.; or whether, given the need for a replacement, the public would prefer another type of easily distinguishable material.

Counterfeit potential and criteria for mechanical, chemical, and physical properties are discussed in further detail below. Before discussing them, however, another factor, also related to both counterfeit potential and public acceptability, should be given consideration, that of intrinsic value.

Intrinsic Value. Intrinsic value, as used here, means the value placed on such materials as gold, silver, or diamonds by virtue of their traditional position in a given civilization as materials of worth or esteem. Such materials often serve as media of exchange. The market value may or may not be influenced by the utility of these materials in an industrialized nation. In earlier times, coins containing silver were used because of their intrinsic value. On the other hand, fiduciary coinage (coinage whose metal value is less than its face value) has also been in common use. In fact, until recently, U. S. silver coinage has been essentially fiduciary in nature. At the present time, however, the price of silver has risen to the point where the United States silver dollar actually contains one dollar's worth of silver. Furthermore, in the other silver coins (dimes, quarters, and half dollars), the silver market value has approached the face value. This trend is actually unfortunate. In effect, the high market value of our present silver coinage has become a liability. The reason is that it is now necessary for the Government to prevent the price of silver from rising above the point at which the metal value exceeds the face value of the coinage, at which point coins might be melted down for their silver content. This the Government does by supplying silver from its reserves at \$1.2929 per ounce, which is the "melt point" of the silver dollar. This silver-sales activity constitutes another serious drain on Government silver stocks in addition to the unprecedented demand from coinage.

There is potential danger in any coinage material that might rise in market value as silver has done. Technological progress results in ever-increasing demands for nearly all materials, especially for metals and alloys. Thus, some technical advance could make a significant difference in the supply and demand of any high-price material used in coinage for its intrinsic value. The situation now existing with silver could then occur with other metals.

Public feeling with respect to intrinsic value in our coinage is perhaps associated with tradition rather than a realization of actual metallic value. Arguments have been advanced both for and against coinage having significant intrinsic value. Evaluation of these arguments is a difficult matter and is regarded as lying beyond the scope of the present study. However, this factor does have relevance as far as counterfeiting is concerned, which is discussed in a following section.

#### Physical, Chemical, and Mechanical Properties

Physical, chemical, and mechanical properties provide the most objective basis upon which to select a coinage material. By contrast, the public-acceptability factor will probably be a subjective matter, since it depends on the public's attitudes rather



than its technical knowledge. The physical, chemical, and mechanical properties which are desirable in coinage are discussed in the paragraphs that follow.

Color. For well over 150 years, the most valuable denominations of U.S. coins (other than gold) have been characterized by the bright white color of the 90 silver-10 copper alloy. Therefore, it is reasonable to surmise that the public will be more likely to accept a new coinage material for dimes, quarters, and half dollars if the color is similar to that of the silver alloy currently used for these denominations. If these coins were made from copper or red brass, they would probably have low acceptability, because they would look like the U.S. one-cent coin, or the low-denomination coins of various foreign countries. A yellow coin (brass colored) might be more acceptable than a red one because there are no U.S. traditions other than gold coins associated with that color.

Density. The public probably is less likely to accept a new coinage material that differs markedly in density from the present silver alloy to which it has become accustomed. For example (assuming no change in coin dimensions), an aluminum coin, though white in color, would be immediately noted because of its low density (2.7 grams per cubic centimeter for aluminum, compared with 10.3 grams per cubic centimeter for the present silver-base alloy). The same reasoning would apply in the case of a material much heavier than the present alloy, such as lead or tungsten. The public probably associates "off weight" with counterfeit coins or play money. In spite of these considerations, a number of countries now have aluminum coins. However, it must be recognized that the problems associated with the introduction of aluminum coins are considerably different in these countries than they would be in the United States.

Density also plays a part in coin-operated devices, which require a certain minimum weight to actuate the mechanisms. A coin that is too light is undesirable.

Mechanical Properties. Certain mechanical properties are highly desirable. For example, a metal should be soft and ductile enough so that it may be readily rolled, blanked, and coined. At the same time, it should possess enough wear resistance after coining to have a useful life in normal circulation of about 25 to 30 years. The harder the metal the better the wear resistance. On the other hand, as the hardness increases, the "coinability" decreases, and fewer coins can be made with a given set of dies. Hence, some compromise is called for.

Chemical Properties. One chemical property important in coins is good corrosion resistance. Coins in circulation are exposed to such things as perspiration, coffee, soft drinks, and moisture. Good corrosion resistance is also required to preserve the original luster and color of the newly minted coin. As an example, zinc, which has been used for coinage by 2 or 3 countries, darkens by corrosion and has an unpleasant appearance after having been in circulation a while. In addition, the material should be essentially nonreactive and nontoxic if accidentally swallowed.

Ring. The "ring" emitted by a coin when it is struck, or dropped on a hard surface, is a familiar sound. This criterion is clearly one related to public acceptability.

The unique ring of the present silver coins cannot be overlooked as an anti-counterfeiting factor. Moreover, some emphasis has been placed upon it in recent publicity releases. Technically, metallic ring is probably associated with the modulus of elasticity, residual stresses, and damping capacity of the material in question. It probably can be adjusted in any given alloy by varying the coin geometry, heat treatment, or cold working. Regardless of its physical nature, a metallic "ring" is associated by many people with genuineness.

Physical Properties. Among the physical properties of coins, the electrical and magnetic properties have a profound effect upon their everyday usage as media of exchange under certain circumstances. These effects are discussed below in relation to the use of coins in coin-operated devices.

#### Effect on Coin-Operated Devices

The ability of coins to be accepted in coin-operated devices is considered as a separate criterion, even though basic physical properties, such as density, magnetic attraction, and electrical conductivity are involved. Vending of goods and services in coin-operated equipment has become a large industry in the United States. Nearly everyone makes use of such coin-operated devices as pay telephones, cigarette and candy machines, toll-road collection boxes, juke boxes, and many others.

Considered as individual industries, the two largest users of coins are the vending-machine industry (merchandise only) and pay telephones. It has been estimated that in 1963, about 28 billion coins passed through vending machines\*, while another 4 to 5 billion coins went into the pay telephones of the Bell System alone.\*\*

All industries which use coin-operated devices have a large investment in coin-handling equipment, and they are therefore very much concerned about any changes in the coinage alloy. The successful operation of this type of business depends to a large degree on special devices, which are referred to in this report as "coin selectors" (see Appendix C). Although these devices vary in degree of sophistication, their main purpose is to accept genuine United States coins and reject all foreign coins\*\*\* and slugs. An essential feature of their ability to discriminate between good and unacceptable coins depends on the so-called "eddy-current" principle. The application of this principle is based on the fact that United States coinage is nonmagnetic and has certain definite values of electrical resistivity. If the material selected to supplant the present silver coins were magnetic, such as iron, or had a high resistivity, the new dimes, quarters, and half dollars would be rejected by the present coin-selector mechanisms. Introduction of a new material that differs markedly from the old might require a major alteration in each of the several millions of these devices now in operation. Some consideration must therefore be given to these industries. If possible, any new coin material that may be recommended should be usable in the present coin-operated devices, with the minimum amount of disruption in business or alteration of equipment.

\* Data courtesy National Automatic Merchandising Association. Breakdown was as follows: 1-cent coin — 2.3 billion pieces; 5-cent coin — 10.4 billion pieces; 10-cent coin — 10.9 billion pieces; 25-cent coin — 4.8 billion pieces.

\*\* Data courtesy Bell Telephone Laboratories.

\*\*\* Adjustments to accept Canadian quarters can be made in the machines.



Effect on Mint Operations

Two Mints are now in operation, one in Philadelphia and one in Denver. They are long-established facilities, and are geared specifically to handle the melting, rolling, blanking, and coining of copper- and silver-base alloys. Thus, in effect, each Mint is an integrated unit with essentially "in house" control of all steps in the process of making coins from melting to the final inspection, counting, and sacking operations. The nature of the operating facilities at each mint, particularly at the Philadelphia Mint, imposes certain limitations on the kind of coinage alloy that can be handled. Much of the equipment is old and of insufficient capacity. However, this is not a serious obstacle at present because only three simple alloys are processed, as shown in the following tabulation:

Coin	Alloy Composition, per cent			
	Copper	Silver	Zinc	Nickel
One cent	95	--	5	--
Five cent	75	--	--	25
Dime	10	90	--	--
Quarter	10	90	--	--
Half dollar	10	90	--	--

Each of the three alloys is relatively easy to melt and cast into rectangular ingots in the Mints' melt shops. The alloys are also easy to roll, and require no hot rolling. Hence, no hot-rolling equipment is available. Facilities for intermediate annealing between cold-rolling operations are available, however. Because the cast metal slabs are relatively small, no heavy breakdown rolls are used.

An additional limiting factor at the mint level is the present coinage presses. These presses, some of which are more than 60 years old, have a design load limit of 150 tons (coinage force). Some of them are actually operated at loads somewhat above their design limit.

Congress has authorized the construction of a new Mint in Philadelphia. It will be equipped with modern high-capacity equipment. However, the new Mint will probably not be ready for operation for several years. If Congress authorizes a substitute coinage material during 1965, the new coins would necessarily have to be made in the present Mints. The Mints could, of course, buy strip from outside vendors if the new alloy were difficult to melt and roll, but the material would still have to go through the present coin presses. It is apparent, therefore, that the limitations of both of the present Mints must be carefully considered before choosing a substitute for the present silver coinage alloy.

Counterfeiting, Illegal Duplication, and  
Slugging Potential

The possibilities for illegal manufacture of coins or slugs constitute a group of related criteria requiring consideration. Neither counterfeiting nor illegal duplication of United States coinage is a serious problem at the present time. Counterfeiting

is defined as the clandestine manufacture of replicas or reproductions of United States design, but in lower cost metals. That counterfeiting and illegal duplication have not been problems is the result of two factors:

- (1) The copper cent and the cupronickel five-cent piece offer little profit potential for the effort expended in counterfeiting or duplicating them.
- (2) Duplicating of the silver coins (dimes, quarters, and half dollars) is made unprofitable because of the high intrinsic value of their silver content. The color, density, "ring", and electrical properties cannot be reproduced with metals other than silver-base alloys. Therefore, counterfeit coins made of base metals are easily detected.

If a base metal or base-metal alloy is selected as a substitute for the present silver coinage, the incentive for illegal duplication will increase because the face value of the coins will be much greater than the market value of the material they are made of.

A second factor, related to counterfeiting, is "slugging"; that is, deliberate manufacture of disks, or importing of low-value foreign coins, to be substituted for genuine coinage in various coin-operated mechanisms. If coin-operated devices are adjusted to accept an entirely new type of coinage material, the ease of obtaining such a material for use as slugs must be considered in choosing the substitute material.



OUTLOOK FOR THE AVAILABILITY OF  
SILVER AS A COINAGE MATERIAL

Since World War II, world consumption of silver has exceeded production, the deficit having been drawn from stocks. Most recently, the depletion of this stock has been accelerated through rising industrial needs accompanied by burgeoning coinage requirements in the United States. This situation, coupled with inelastic production potential and limited resources, has precipitated an imbalance in supply which demands corrective action.

About two-thirds of the silver consumed in the Free World has been for industrial uses (arts and industry). The rest is utilized in coinage.

In the 1963 calendar year, as shown below, 419 million ounces of silver were used in the Free World for industrial uses and in coinage, resulting in a deficit of 209 million ounces. This deficit was equivalent to the total Free World silver production for that year. The data show that supply and demand for the metal are more nearly in balance in other Free World countries and that the problem of scarcity of silver is centered in the United States.

	Millions of Troy Ounces <sup>(a)</sup>		
		Other	Total
<u>1963</u>	<u>United States</u>	<u>Free World</u>	<u>Free World</u>
Production	35	175	210
Consumption			
Arts and industry	110	137	247
Coinage	<u>111</u>	<u>61</u>	<u>172</u>
Total	<u>221</u>	<u>198</u>	<u>419</u>
Deficit (production minus consumption)	(186)	(23)	(209)

(a) Note that all "ounces" referred to in this report are troy ounces.

Data show that the Free World deficit in silver in 1964 was 341 million ounces, up from 209 million ounces in 1963.\* Most of this increase was due to increased use of silver in U. S. coinage, which was 203 million ounces in 1964, up from 111 million ounces the previous year. Silver used in U. S. coinage in 1964 therefore was almost equal to the 215 million ounces of silver produced in the Free World for that year.

In 1964, as in previous years, most of this Free World deficit was made up by withdrawals from the U. S. Treasury stock of monetary silver.\*\* This is illustrated for 1964 as follows:

\* "The Silver Market in 1964", Handy and Harman, New York.

\*\* In addition, 19.8 million ounces of silver in silver dollars was withdrawn from the Treasury in 1964. Most of this silver went into hoarding and was not used to finance the world deficit.

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	<u>Millions of Troy Ounces</u>	
Total Free World deficit (1964)		341
Withdrawals from U. S. Treasury		
Subsidiary Coinage	203	
Redemptions of Silver Certificates	<u>141</u>	
Net Change	344	<u>344</u>
Total Stock of Silver, U. S. Treasury,		
December 31, 1963		1,584
Total Stock of Silver, U. S. Treasury,		
December 31, 1964		<u>1,220</u>
Net Change		(364)

The net withdrawal from the Treasury for 1964, therefore, was 364 million ounces.

The order to propose a solution to the shortage of silver it is important to establish the adequacy of the U.S. monetary stock of silver for projected coinage needs. This forecast then serves as a basis for evaluating alternatives for alleviating the projected scarcity of the metal.

In Appendix B a projection is made of the life expectancy of the Treasury stock of silver based upon total Free World supply and demand for silver in future years. This forecast combines conditions of high Free World productivity (higher than the average over the past 15 years) of silver with only moderate increases in demand (2 per cent per year compared to 4 per cent per year since 1950) by industry and the arts in the Free World, together with decreasing coinage in other Free World countries.\* The uncertainty of the forecast of future demands for U.S. coinage is reduced through the consideration of three situations involving high, medium, and low rates of coinage demand. Table 1 is a summary of the results of this forecast.

The table shows that should the present demand for coinage persist, the U.S. monetary stock of silver could be exhausted in little more than 3 years, assuming no change in the present 90 silver-10 copper alloy. If the silver content of U. S. coins were reduced to 50 per cent, the forecast shows that this stock would be exhausted by 1975, even under the lowest level of expected coinage demand. However, the life of the Treasury stock could possibly be extended to 1979 by reducing the silver content of coins to 15 per cent.\*\* Eliminating silver from U.S. coinage altogether might extend this stock through 1983.

\* It is assumed that most of the projected world deficit in silver, excluding U. S. coinage, will be covered by withdrawals from Treasury stocks through the redemption of silver certificates. No provision is made for the minting of silver dollars.

\*\* If an alloy containing 15 per cent silver is technically undesirable, one possibility would be to accomplish the reduced silver consumption rate by adopting a 50 silver-50 copper alloy for a single denomination.



TABLE 1. SUMMARY SHOWING YEAR IN WHICH U.S. MONETARY STOCK OF SILVER WOULD BE EXHAUSTED, DEPENDING ON THE SILVER CONTENT OF THE COINAGE AND THE DEMAND FOR COINS

Level of Coinage Demand	Alternative Silver Content of U. S. Coins, per cent <sup>(a)</sup>				
	90	50	30	15	0
I. <u>High Level</u> - Coinage production at full Mint capacity of about 300 million ounces per year	1968	1969	1971	1974 <sup>(b)</sup>	1979 <sup>(b)</sup>
II. <u>Medium Level</u> - Continuation of 1964 coinage rate of about 200 million ounces per year	1969	1971	1973	1976	1980
III. <u>Low Level</u> - Cyclic down-turn in coinage demand beginning early in 1965	1973	1975	1977	1979	1983

(a) In these projections it is assumed that changes in silver content of U. S. coins would not become effective until December 31, 1965.

(b) It should be noted that industrial demand for 1964 was at a very high level. If it should increase at the rate of 2 per cent per year from this level, the Treasury stocks could be exhausted in 1971 for the 15 per cent silver content alternative, and in 1974 if no silver were used in coinage. Details of this calculation are shown in Table B-10.

AVAILABILITY AND COST OF VARIOUS METALS  
CONSIDERED AS ALTERNATIVES TO  
SILVER IN COINAGE

Figure 1 shows the quantity of various metals that have been used each year since 1957 in the manufacture of U.S. coins. The increase in demand for copper and silver for U.S. coinage since 1959 is impressive. The amount of copper used in coinage is a relatively small proportion of the total production and consumption of the metal in the U.S., while the consumption of silver in U.S. coinage alone equals total world production. Thus, the criterion of availability is seen to be of paramount importance in the selection of an alternative material for coinage. If the currently available and potential capacity to produce a metal is insufficient to meet the present and projected needs for coins, it is pointless to use such a metal regardless of its technically desirable characteristics.

A large proportion of the known metallic elements were examined. These are listed in Table 2. This list contains all metals considered as remotely possible alternatives to silver. The initial selection or rejection of each metal was based on the criterion of availability and price.

Although the density of the present silver-base alloy is about 10.3 grams per cubic centimeter, the list includes elements that range in density from 1.7 for magnesium to 22.6 for osmium. Conceivably, high-density elements could be used as alloying elements to adjust the density of some possible low-density metal to about the desired value. Some of the elements are rather pointedly inappropriate for coinage. For example, mercury is a liquid at room temperature, and only a small number of alloys are possible. By law, gold cannot be used for coinage. The transuranium metals and rare-earth metals were not considered because of their extremely limited availability. Radioactivity, present in the uranium and transuranium elements, even in harmless amounts, would undoubtedly be a reason for low public acceptability of these metals as coinage. From the remaining elements, the following are rejected as possible coinage metals mainly because they do not meet the criterion of availability. Other pertinent reasons for rejection are also mentioned in the text.

Bismuth. There is no appreciable domestic supply. The metal has a low melting point, undesirable mechanical properties, a poor color, and world production is only about 4 million pounds.

Cadmium. This low-melting metal is in limited supply and has considerable strategic value. It is obtained mostly as a by-product of zinc production. The United States meets much of its requirements by importing.

Cobalt. Practically all of the supply of this metal is outside of the United States. For example, a large proportion comes from the Congo. In the event of a prolonged emergency, the supply could not be guaranteed. Cobalt could be considered as an alloying element, however.



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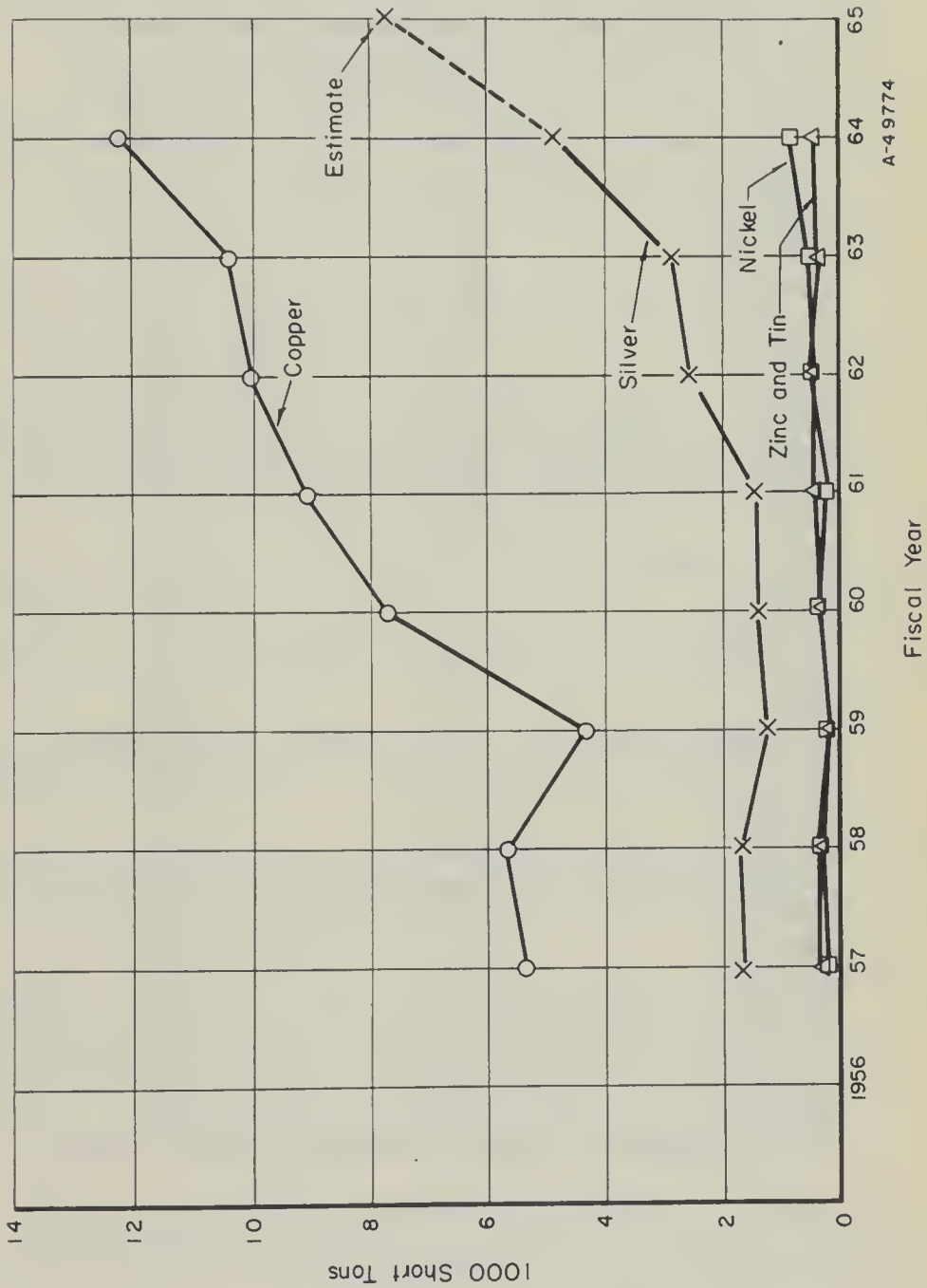


FIGURE 1. QUANTITY OF VARIOUS METALS USED IN UNITED STATES COINAGE

TABLE 2. METALLIC ELEMENTS CONSIDERED

Element	Density, g/cu cm	Melting Temperature, F
Aluminum	2.7	1200
Bismuth	9.8	520
Cadmium	8.6	610
Cobalt	8.8	2720
Chromium	7.2	3407
Columbium	8.6	4475
Copper	8.9	1980
Gold	19.3	1945
Hafnium	13.1	3900
Indium	7.3	315
Iridium	22.5	4370
Iron	7.8	2795
Lead	11.3	620
Manganese	7.4	2270
Mercury	13.5	-40
Molybdenum	10.2	4730
Magnesium	1.7	1205
Nickel	8.9	2645
Osmium	22.6	5430
Palladium	12.0	2825
Platinum	21.4	3215
Rhenium	21.0	5740
Rhodium	12.44	3560
Ruthenium	12.2	4080
Silver	10.5	1760
Tantalum	16.6	5425
Titanium	4.5	3035
Tungsten	19.3	6170
Uranium	19.1	2070
Vanadium	6.1	3435
Zinc	7.13	785
Zirconium	6.49	3365



Hafnium. Hafnium has a very high melting point (3900 F) and is produced as a by-product in the preparation of zirconium metal for nuclear-reactor purposes. The metallurgy is such that the cost of sheet and bar material is about \$135 per pound. The bulk of the limited production of hafnium is allocated to nuclear-reactor use. It can be used only as an alloying addition.

Indium. This is a very soft metal (like lead) and has a low melting point. The price is high and the amount available is insignificant.

Iridium. A very costly metal of high density, iridium is available in the United States only in small amounts.

Lead. The metal is very soft, has a low melting point, and low strength. Lead has a "bad" name in reference to coinage because of associations with counterfeit coins.

Magnesium. This metal is very plentiful in the ocean. It is, however, extremely low in density (1.7 grams per cubic centimeter). The corrosion resistance is not good, especially when galvanic couples are present, such as magnesium in contact with copper. Its resistance to wear is low and it cannot be recommended for coin purposes.

Osmium. This metal is available only in very limited amounts and the price is very high.

Palladium. The price of palladium is higher than that of gold, and the quantities are very limited.

Other Precious Metals: Platinum, Rhenium, Rhodium, Ruthenium. Each of these metals is far too costly and scarce for consideration as coinage.

Tantalum. About 99 per cent of the tantalum ores processed in the U.S. are imported from the Eastern Hemisphere. The reserves are quite limited. The cost of sheet is currently about \$50-\$75 per pound. Its density is greater than that of lead.

Vanadium. This metal is difficult to prepare in high purity and has a high melting point (3435 F). It is used mostly as ferrovanadium (an iron-vanadium alloy) which is the principal source of vanadium for alloy steels. It has practically no use as the metal or as a base for alloying. The United States is a major world producer of this element but the cost of the metal in sheet and bar forms is presently about \$40 per pound.

The metals remaining as candidate possibilities for coinage require more extensive appraisal from the standpoint of all important criteria. Certain of these metals may be considered very improbable if used alone, but they might be used as additions to alloys made up of two or more elements. This possibility is discussed below:

Chromium. Most of the available chromium ore is in the eastern hemisphere. The metal is generally classified as a strategic or critical material in the United States. The pure metal is difficult to prepare and is little used except as a thin-plating material. However, the availability of chromium as an alloying element appears firm enough to allow stainless steel to be definitely considered as a coinage metal. The supply-and-demand situation relative to this material is discussed more fully in Appendix A.

Columbium. Columbium metal, except as an alloying ingredient in cobalt alloys and steels has, until recent years, been considered mostly as a curiosity. Lately it has received some attention as a metal for high-temperature applications. Most of the high-grade ore is found outside the North American continent; but large amounts of low-grade ore occur in Canada (now being produced) and some in the United States. Very large low-grade deposits exist in South America, but much of the present production is from Africa. The production of the metal in 1964 was only about 25 to 30 tons. However, industry representatives estimate that the present production capacity could be increased to meet coinage needs within a period of about 2 years. The metal has some good qualities for coinage, such as excellent corrosion resistance, good coinability, and relatively high density (8.6 grams per cubic centimeter). Its color is gray but not unpleasant. The current price of columbium sheet and strip is higher than that of silver but this could be reduced as a higher rate of production reduced the cost. In spite of the price and present supply picture, the metal has a potential warranting further consideration.

Zirconium. The United States is believed to be self-sufficient in this metal, at least for foreseeable future needs. The present price is about \$10-15 per pound for sheet. Most of this metal is now being used in nuclear-reactor applications.

The foregoing screening process indicates that the metals chromium, columbium, and possibly zirconium deserve further consideration either as minor alloying elements or for use in essentially the unalloyed condition for coinage. The metallic elements remaining after the preliminary screening process are:

Aluminum	Molybdenum
Chromium	Nickel
Columbium	Titanium
Copper	Tungsten
Iron	Zinc
Manganese	Zirconium

Of these metals, chromium, manganese, zinc, molybdenum, and tungsten are considered mainly as alloying elements. For example, the present one-cent coin contains an alloy addition of 5 per cent zinc. This quantity of zinc is small compared to the total supply and compared to the total amount consumed in the United States.

An appraisal of the supply and demand for each of these metals (with the exception of iron) is contained in Appendix A. This appendix includes data on the requirements and availability of each metal, covering the period from 1960 to the year 2000.



PHYSICAL, CHEMICAL, AND MECHANICAL PROPERTIES

A survey of the remaining 12 elements discussed in the foregoing section showed that, for the foreseeable future, the elements silver, chromium, manganese, molybdenum, and tungsten should be considered only for minor alloy additions with respect to coinage. The elements iron, copper, nickel, aluminum, columbium, titanium, zirconium, and various naturally occurring substances used in ceramics and plastics, should be given further consideration for use as the major constituents in United States coinage.\* From these candidate raw materials, then, must be selected the alloy, pure metal, combination of metals, or nonmetallic materials which will serve as a substitute for the present 90 silver-10 copper alloy.

Before proceeding with the examination of possible substitute materials, it would be well to discuss certain properties of the present coin-silver alloy as well as the implications of these properties relative to the choice of a coinage material. This alloy, which has been standard in the United States for so many years, has a pleasing white color, is nonmagnetic, has a low electrical resistivity, and is relatively heavy. The original basis for the U. S. choice of silver for a coinage alloy seems natural enough in view of the long history of silver as a coinage metal and such desirable properties as ease of melting, rolling, and coining. That it is low in electrical resistivity and is nonmagnetic is fortuitous, since these properties provide a sensitive means of distinguishing this alloy from many other alloys that could be used to operate coin-actuated mechanisms. It is also interesting that the combination of white color, high density, low electrical resistivity, and absence of magnetism is unique to the silver-copper alloy system. Moreover, the alloys are easy to process in the Mints. No other element or alloy has this particular combination of properties.

Physical Properties Needed in Coinage for  
Coin-Operated Mechanisms

With coinage unchanged in size and alloy over so many years, industries based on coin-operated mechanisms have had a chance to develop and grow.\*\* Important to these industries has been the invention of coin selectors capable of detecting slugs on the basis of electrical conductivity, density, size, and magnetic characteristics.

Permanent magnets play an important role in these selectors. They remove magnetic coins and slugs and are the heart of the eddy-current device that separates coins and slugs according to a property represented by the product of electrical resistivity and density. This product, for the coin-silver alloy, is about 21.6 microhm-g/square centimeter, while for the 5-cent piece it is about 286. The eddy-current type of coin selector is adjusted to accept genuine silver coins and to reject copper and many of its alloys, including brasses such as the 90-10 copper-zinc alloy.

If no changes are to be required of industries which use coin-operated devices, the physical properties of a substitute material must be specified in such a way as to make the behavior of the new material identical with present coinage in coin-operated mechanisms.

\*Magnesium is available in almost unlimited amounts from the ocean but is eliminated from consideration as a coinage material because of its extreme lightness and poor corrosion resistance.

\*\*See Appendix C, Coin-Operated Devices.

### Color

The choice of color for U. S. coinage is largely a matter of public acceptance. Traditionally, the U. S. subsidiary coinage has been silvery-white. Suggested alloys should be considered from this standpoint.

Just as white has been associated with subsidiary coinage, copper-red has been associated with minor coins both here and abroad. Accordingly, it would seem inadvisable to substitute a red alloy for our present coin silver.

Shades of yellow from the typical brass to a reddish-golden color may be more acceptable than red coins because of the association with gold.

It is difficult to make a categorical statement of public reaction to any change. It is believed, however, that strong preference would be voiced for white alloys over any yellow or red alloy.

In the long-range picture, in which plastics or ceramics might be considered, very distinctive colors could be deliberately chosen as an anti-counterfeiting measure. Such a possibility must be considered quite drastic, however.

### Candidate Materials Considered From the Viewpoints of Coin-Operated Mechanisms and Color

A substantial number of metals and alloys can be suggested as candidates for replacing the present coin silver. In addition, another kind of material, called a "composite", has been considered. Appendix C, Coin-Operated Devices, treats this subject in some detail.

When certain desirable properties cannot be realized with a homogeneous material, they can often be met in composite systems. In composite systems two or more materials, each unable to satisfy all the requirements, are combined in such a way that the over-all behavior of the composite is satisfactory. One such composite is called a "multilayer material", wherein the components are bonded together in sandwich fashion in such combinations as to obtain the properties needed. Notable examples of multilayer metal systems are the bimetallic thermostat alloys, the stainless-steel-clad copper pots and pans, and precious-metal-clad plate for watch cases. Similarly, a multilayer system for coinage material can be assembled as illustrated in Figure 2. With the proper proportion of a high-conductivity metal (which can be either the core or the cladding), composites can be bonded, rolled into strip, blanked, and stamped into coins which will behave in the coin selectors in the same way as the current silver-alloy coins. Some of the composite or multilayer systems considered for coinage purposes are the following:

- Cupronickel (75 Cu-25 Ni) clad over pure copper
- Cupronickel clad over various silver-copper alloys
- Silver-copper alloys clad over cupronickel
- Silver-copper alloys clad over modified coppers
- High silver-copper alloys clad over low silver-copper alloys.



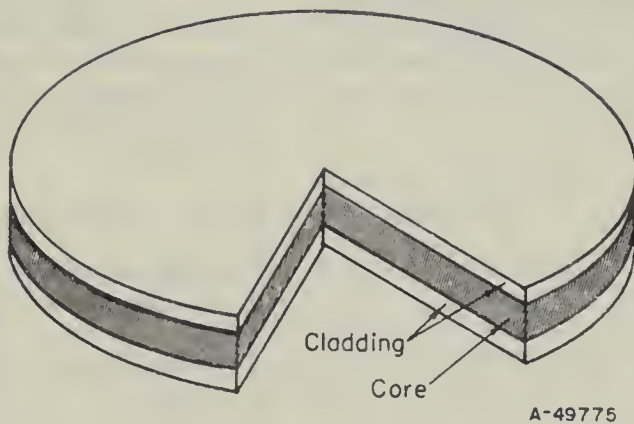


FIGURE 2. MULTILAYER COMPOSITE COIN BLANK

Each of the composite materials listed has outer layers consisting of an alloy with a white color. Thus, it can be seen that numerous different composites can be devised that can satisfy both the public-acceptance criterion of color and the requirements of coin-operated devices as regards low electrical resistivity (or better, the correct product of electrical resistivity  $\times$  density).

There are other possible candidate metals and alloys that might satisfy the criteria for coinage except that they would not be compatible with present coinage in coin-operated mechanisms. Still another group of metals enters the picture if the public would accept a copper-colored coin.

Table 3 lists a number of candidate materials. The arrangement and classification of the materials in this table are designed to separate and emphasize the choices with regard to the criteria of color (public acceptability) and usability in coin-operated mechanisms. The arrangement in Table 3 thus emphasizes some conflicting requirements that a coinage alloy must satisfy. For example, if a white color is desired regardless of the resistivity  $\times$  density product or magnetic properties, then a rather large number of possibilities exist. If, on the other hand, a white color is desired, combined with a resistivity  $\times$  density product satisfactory for coin-operated devices, there are only a few possibilities. Lastly, if a reddish color were acceptable, a number of copper-base alloys are available which could also be made to work in coin-operated devices.

Appendix C discusses the various candidates from the viewpoints presented in Table 3. If it is desired for coin-operated devices to continue in operation without modifications, and if a white color is required for public acceptance, the following two appear to be the best choices:





- Silver-copper alloys (depending on the silver supply picture)
- Various multilayer composites such as cupronickel-clad copper.

If modification of present coin-operated devices is permissible, a wide variety of materials is available to choose from. Nevertheless, the nonmagnetic materials would be preferable to the magnetic ones, in order to minimize the disruption in the use of coin-operated devices. Lightweight materials such as aluminum alloys, plastics, and ceramics would cause more disruption in the use of coin-operated machines than would other materials.

#### Consideration of Mechanical and Chemical Properties

The mechanical properties of the candidates must be such as to insure wear resistance and resistance to normal handling procedures. Nevertheless, the strength characteristics must not be so high as to prevent coining. The corrosion resistance must be high enough to insure good appearance over a long time period.

For the candidates listed in Table 3, the modified coppers may be too soft to permit their use, though if nickel, zinc, aluminum or silicon are the modifiers, it is possible to obtain satisfactory strength and hardness. The durability of ceramics (with respect to shattering) needs further study. The coinability of certain of the materials is very limited; notable in this respect are most stainless steels, monel, and titanium. These aspects are discussed in the section Mint Operations and Their Relationship to Alternative Coinage Materials.

The corrosion resistance of many aluminum alloys is not outstanding. This factor, along with low density, excludes aluminum alloys from further consideration.

MINT OPERATIONS AND THEIR RELATIONSHIP  
TO ALTERNATIVE COINAGE MATERIALS

Any material taking the place of the current silver coinage alloy must be capable of being handled by the Mints. It is essential that the material be adaptable to the present Mint facilities, especially with regard to coinability. Other considerations include upsetting (edge rolling), strip rolling, and melting. A discussion of the United States Mint facilities is given in Appendix D.

Coinability

Coinability refers to the ability of the coinage material to take a sharp, clear impression, of the proper depth and design, when the preformed blank is pressed between two dies. It is also important that the material possess good coinability under conditions of high-speed coining, without excessive die pressures.

From the standpoint of coinability, based on experience and actual Mint trials of a number of possible substitute coinage metals, the following materials are judged to be acceptable, with little or no change in processing methods. Appendix D summarizes the experimental work:

- (a) Cupronickel (75Cu-25Ni)
- (b) Pure nickel
- (c) Columbium
- (d) Multilayer or composite material using combinations of cupronickel, copper, and silver
- (e) Silver-copper alloys in all proportions
- (f) Nickel-5 silicon alloy (requires a change in annealing procedure).

Those metals and alloys judged to have lower coinability than the above group were:

- (a) Stainless steels (both straight-chromium types and austenitic chromium-nickel types)\*
- (b) Zirconium
- (c) Titanium
- (d) Nickel-chromium alloys.

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\* A stainless steel recently developed by Republic Steel Company shows promise for better coinability than any of the currently available stainless steel. This new steel has not been fully evaluated at the present time, however.



A process change, such as the addition of an annealing treatment, or a change in design of the coining dies, might permit some of the questionable materials to be successfully coined. However, a die design change is not always desirable from the point of view of counterfeiting and illegal duplication, which are discussed later.

### Upsetting

The upsetting operation is often termed "edge rolling"; its purpose is to thicken the edge or rim of the blank prior to coining. This is done to provide sufficient metal at the edge for the coined blank to develop a rim greater in height than the rest of the coin. This provides wear protection to the coin and also allows coins to be stacked evenly.

Mint coining experiments described in Appendix D showed that some problems exist with certain materials during this processing step. For example, the nickel-5 silicon alloy and the stainless steels work hardened to an appreciable extent during edge rolling. The surfaces of the coin blanks near the edge tended to become hardened. This, in turn, led to difficulty when the blanks were coined. The cold-worked areas adjacent to the rim did not flow sufficiently in the coining die, and the lettering at this location did not fill out properly. In a case such as this, the annealing treatment ordinarily given the blanks before upsetting could be given instead to the upset blanks.

Some buckling of the blanks occurred during upsetting of the copper-cored multi-layer composite materials because of the softness of the core. Possibly, some adjustments in the blank annealing treatment would be necessary to overcome these difficulties, or, as suggested in the preceding paragraph, the annealing operation could be deferred until the blank was upset.

### Rolling and Annealing

Essentially, the Mints are presently limited in rolling capabilities to those of a brass mill and, at present, they are equipped to do only cold rolling with intermediate annealing in controlled-atmosphere furnaces. Except for such metals as zirconium, titanium, and columbium (which require vacuum annealing), the Mints could probably cold roll most of the other possible substitute alloys such as monel, stainless steel, and certain composite materials. However, for anything other than copper-nickel, silver-copper, or copper-base alloys, additional annealing facilities would be required. Rolling of the 50 silver-50 copper alloy may require more annealing than will the 90 silver-10 copper alloy.

To handle the rolling of such metals as columbium, titanium, and zirconium, the Mints would require high-temperature vacuum-annealing equipment. It would probably be necessary to hot roll (1500-2000 F) columbium to break down the ingot structure. This, in turn, would require conditioning to remove the contaminated surface layers from the breakdown product. The metal cold rolls easily, however.

### Melting

Melting capabilities of the Mints are equivalent to those of a brass mill. Consequently, to melt such materials as nickel (also high-nickel alloys), stainless steels,

and similar metals, a change in linings for the induction-melting equipment would be required. The melting procedure and probably the casting technique would also require changes to handle these metals and alloys properly. The melting of metals such as columbium, zirconium, and titanium requires special consumable-arc melting equipment. This would mean a considerable capital investment for the equipment and related power supply and controls. Columbium, which deserves special consideration because it coins very well, would, for the present, have to be melted and rolled by an outside producer and be supplied to the Mints in coils for blanking and coining.

#### Additional Operations

Certain alloys or metals will require a supplemental treatment to improve the appearance of the coin. Thus, for example, the 50 silver-50 copper alloy takes on a yellowish color during processing. The coin blank can be brightened to a silvery-white color by dipping in a nitric acid solution. Similarly, zirconium can be brightened by dipping in a mixture of hydrofluoric and nitric acids. The Mints are not now equipped for such processes, however.

#### Conclusions

From the standpoint of Mint operations, the following conclusions apply:

- (1) If the total Mint facilities from melting to coining are to be involved, the following substitute coinage materials would not require any changes in present operations:
  - Cupronickel
  - Copper-base alloys
  - 50 silver-50 copper alloy
- (2) If rolling, blanking, and coining only are to be involved, the acceptable substitute coin materials include, in addition to those listed in (1):
  - Nickel, nickel-5 silicon
  - Multilayer composite materials
- (3) If strip were purchased and blanked and coined by the Mints, the following additional materials would be acceptable:
  - Columbium
  - Multilayer composites [ see also (2) above]



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(4) Materials not acceptable or questionable (especially as relates to coining) for the present Mint facilities, are:

- Stainless steels
- Nickel-chromium alloys
- Titanium
- Zirconium

(PAGE 30 FOLLOWS)

POSSIBLE CHOICES OF MATERIALS  
FOR U. S. COINAGE

When all the various criteria have been applied to the possible candidate materials for coinage, it is found that no single material satisfies all of the criteria. Several of the candidate materials possess certain desirable characteristics not possessed by others. Specifically, the following materials have been selected because they have certain advantages over each of the others. They are discussed further in the paragraphs that follow:

1. Silver-copper alloys, particularly 50 silver-50 copper.
2. Cupronickels, particularly 75 copper-25 nickel.
3. Copper-nickel-zinc alloys (nickel silvers).
4. Columbium and zirconium.
5. Multilayer composites.
  - a. cupronickels on copper
  - b. silver-copper alloys on copper
  - c. high silver-copper alloys on low silver-copper alloys
  - d. silver-copper alloys on cupronickel and vice versa
6. Nickel and high-nickel alloys.

These materials are discussed further below.

Silver-Copper Alloys

The principal advantages of silver-copper alloys are that such alloys have a high degree of public acceptance because of a long history of use as coinage; they are relatively easy to process in the Mints; and their use would require no changes in present coin-operated devices.

The most serious disadvantage of any silver-copper alloys is that they do not satisfy the criterion of supply and price. As shown in Appendix B, any plan for long-term use of silver for coinage must be considered as questionable; the supply and price is assured only as long as the Treasury stocks are able to supply silver for this purpose. Nevertheless, if sentiment and tradition are considered to be compelling reasons for using a silver-copper alloy, then it would seem prudent to limit the silver content to 50 per cent, and to use the alloy for only one denomination of coin. In this way the overall consumption of silver would be about 16-17 per cent of the normal consumption and might permit the Treasury stocks to last for perhaps 10 to 15 years, depending on the coinage demand and speculation.

A further difficulty with a silver-copper alloy containing less than about 70 per cent silver is that the tarnish resistance is markedly lower than that of the present



90 silver-10 copper alloy. An acid dip would be required to give the coin a good appearance when newly minted, although it would tarnish in use. A solution to the tarnish problem can be achieved by using a sandwich-type of material with a high silver alloy for the outer layers and a low silver alloy as the core. These possibilities are discussed below, in the section Multilayer Composites.

#### Cupronickels

The term "cupronickel" applies to a series of alloys of copper and nickel in which copper is the major element. Because of the Mint's familiarity with the 75 copper-25 nickel composition, however, this particular alloy has been singled out for special attention. The chief advantage in using the 75 copper-25 nickel alloy for subsidiary coinage would be that the Mints could make the conversion with little or no disruption in their processing methods. Also, its wear resistance is superior to the present silver alloy.

Among the objections to the alloy is that it is low in cost and would invite illegal duplication and slugging. However, the main difficulty is that a large proportion of the coin-operated machines would require changeover to be able to accept both the present coinage and the new coinage.

The color of the 75 copper-25 nickel alloy is pleasing, though not as white as coin silver. Copper-nickel alloys containing about 45 per cent nickel are much whiter than the 75-25 alloy. However, because of higher melting and annealing temperatures, some change in Mint procedures would be necessary. Thus, the chief advantage to cupronickels would be lost, without a significant reduction in the disadvantages. Therefore, it is judged that if a cupronickel is chosen it should be the 75 copper-25 nickel alloy.

#### Copper-Nickel-Zinc Alloys (Nickel Silvers)

Because copper-nickel-zinc alloys can be made with only minor adjustments in Mint processing, the white alloys (typified by the 65 copper-18 nickel-17 zinc composition) may be considered as alternatives to the cupronickels. In general, the advantages and disadvantages are the same as for the 75 copper-25 nickel alloy. However, the cost of the raw materials would be somewhat lower than for the cupronickels. On the other hand, this cost advantage would be offset in part by the need for somewhat more complicated Mint processing methods. Ease of changeover in the Mints gives the cupronickel preference over the nickel silvers for subsidiary coinage. However, if the subsidiary coinage is changed to cupronickel, the alloy for the five-cent coin might well be changed to a copper-nickel-zinc alloy so as to distinguish between low- and high-value coins. If the difficulties of Mint changeover are not regarded as decisive, nickel silver could be used for subsidiary coinage.

#### Columbium and Zirconium

The metallic elements columbium and zirconium are worthy of consideration because they have the advantage of being difficult (though not impossible) to counterfeit, and so high in price as to virtually eliminate illegal duplication.

Columbium proved to have good coinability. The use of zirconium, however, would require some modification in die design or coining methods in order to yield satisfactory coins. The somewhat poorer coinability of zirconium is partially compensated for by a good ore supply picture, although metal-production capacity would have to be increased.

Processing of columbium and zirconium is so significantly different from current Mint practices that it would be preferable to purchase strip from outside suppliers.

Adoption of columbium or zirconium would require changes in coin-operated devices similar to those required for cupronickel.

However, the advantages of high resistance of columbium or zirconium to counterfeiting and illegal duplication must be weighed against the ease of adapting cupronickel to Mint procedures.

In view of this reasoning, it is believed that the over-all costs of adopting cupronickel, columbium, or zirconium should be compared. This comparison shows that the increased cost of adopting either columbium or zirconium would be in the order of \$100,000,000 annually, based on a consumption of 10,000,000 pounds per year. This seems to be a high price to pay for preventing counterfeiting or illegal duplication.

Neither columbium nor zirconium have prestige value, in the sense that silver has. Columbium and zirconium, however, do possess certain characteristics - high price, attractive name, and application in the atomic energy industry - that lend themselves to the creation of a desirable "public image". A vigorous public relations campaign would be needed to achieve this end.

In balance, however, the advantages seem outweighed by the disadvantages. Therefore, no further consideration will be given to columbium or zirconium.

#### Multilayer Composites

The multilayer composites (also called "clad metals" or "sandwich metals") have received attention as materials which can be used to produce a coin with almost the same appearance as the present coinage, capable of acceptance in present coin-operated devices, and yet containing either no silver at all or a drastically reduced amount of silver. The uniqueness of multilayer composites would discourage both counterfeiting and illegal duplication, while, at the same time, the cost of production would be moderate.

Processing, for a time, would be outside of the Mints' capabilities. However, various methods for producing multilayers have been developed in industry, and it is believed that Mint processes could be adapted to the manufacture of multilayer composites without serious difficulties. The Mint could purchase strip or re-roll bar from outside suppliers until its own skills have been developed. While the characteristics of the multilayer composites to be discussed have been established on an experimental basis during the course of this study, feasibility for full-scale Mint operations remains to be determined. Furthermore, it would be necessary for the Mint to have assured sources of supply until it developed its own capability to produce any multilayer that might be chosen as a coinage material.



The characteristics of various combinations of multilayers are discussed below.

#### Cupronickel on Copper

Of the various choices of multilayer, cupronickel on copper possesses the advantages of low cost and good scrap value, in addition to the general advantages previously noted for cupronickel. Scrap must be taken into account because about 30 per cent of the strip remains as a skeleton after the coin blanks have been punched out. Scrap from the cupronickel-copper combination, since it consists only of copper and nickel, could be utilized to make more cupronickel simply by adding proportionally more nickel to the charge material in the melting furnace.

A feature of this combination is that the exposed edge of the coin is copper colored. This has the advantage of being difficult to counterfeit or duplicate. On the other hand, the appearance would be distinctly different from traditional U. S. coins and might cause some problems relative to public acceptance.

#### High Silver-Copper Alloys on Copper

A sandwich consisting of a silver-copper alloy on copper has the advantage of providing a coin close in appearance, except for the copper rim, to the present coins. It would have a better appearance than the cupronickel-copper composite. Moreover, it would have higher intrinsic value than the cupronickel-copper composite.

Scrap could be reclaimed by using it to make the silver-copper alloy cladding.

The primary disadvantage, as pointed out in connection with silver-copper alloys, is that continued use in coinage would be limited because of the silver supply situation.

#### High Silver-Copper Alloys on Low Silver-Copper Alloys

If the red rim on the copper-cored composites is objectionable, it can be eliminated by using a low silver-copper alloy for the core. For example, a possible combination is to have 80 silver-20 copper for the outside layers and 30 silver-70 copper for the core. Such a coin would be close in appearance to present coins. Though the rim would tarnish, it might be preferable to the copper color.

Supply of silver is again the main obstacle to adoption of such a combination.

#### Silver-Copper Alloys on Cupronickel, and Vice Versa

Another means of obtaining a "white-on-white" combination is by cladding cupronickel with, say, an 80 silver-20 copper alloy. The principal disadvantage to this combination is that the scrap would have to be reclaimed by separation of the elements, rather than by remelting, because it would consist of copper, nickel, and silver.

Furthermore, as the high-conductivity silver-copper alloy wore off the faces, the response of the coin to the eddy-current coin selectors would change markedly. The reverse combination, cupronickel on a silver-copper alloy, would not be susceptible to this disadvantage. However, it would not have the close resemblance to the present coinage which the silver-copper on cupronickel would have.

There seem to be sufficient deficiencies in this approach to drop it in favor of the other multilayers discussed above.

#### Nickel and High-Nickel Alloys

Nickel has enjoyed considerable usage in other countries as coinage. It is considered here because of its relatively good appearance, corrosion resistance, and coinability.

Because nickel is magnetic, however, almost every type of coin-operated device would have to be altered if it were adopted for coinage. For this reason alone, it cannot remain as a strong candidate for U. S. coinage.

Other materials, though not presently acceptable, would require certain changes to be made in most machines, but not in all. Cupronickel has been discussed in this light. Other such possibilities are nickel-base alloys containing alloying agents that cause the magnetism of nickel to disappear. Nickel-5 silicon, developed by the International Nickel Company, is an example of such an alloy.

The main advantages advanced for these types of alloys is that they are as highly regarded as nickel, which is accepted in many countries. It cannot be argued, however, that their high regard is in any way comparable to the regard for silver. Compared to the cupronickels, they are somewhat brighter in appearance, but their cost is higher and the amenability to Mint processing is lower. Therefore, it is judged that the high nickel alloys should be dropped from further consideration.

Attention is also called to a nickel-5 silicon alloy with a magnet material in the center of the coins. This composite, discussed in Appendix C, was developed by the International Nickel Company as a means of operating the present coin selectors in coin-operated devices. The reasons for dropping this composite from further consideration are given in Appendix C.

#### PRELIMINARY EVALUATION OF MATERIALS FOR SUBSIDIARY COINS

##### Summary of the Chief Advantages and Limitations of Various Candidates

The previous section indicated that three types of materials stand out above all others for one or more reasons. These three are:



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- 50 silver-50 copper alloy
- 75 copper-25 nickel alloy (and the closely similar 65 copper-18 nickel-17 zinc alloy)
- multilayer composite with a core of either copper or a low silver-copper alloy

Each of these three kinds of materials is outstanding in at least one respect, but each fails to fully satisfy at least one of the criteria upon which a selection should be based. The desirable and undesirable aspects of the various choices are recapitulated below:

Material	Main Advantages	Main Limitations
50 silver-50 copper	<ul style="list-style-type: none"> <li>• Maintains tradition of silver in coinage</li> <li>• Acceptable in present coin-operated devices</li> <li>• Minor effect on Mint processes</li> <li>• Low counterfeit or duplication potential</li> </ul>	<ul style="list-style-type: none"> <li>• Limited by the supply of silver</li> <li>• Much lower tarnish resistance than present coins</li> <li>• High price</li> </ul>
75 copper-25 nickel	<ul style="list-style-type: none"> <li>• Practically no effect on Mint processes</li> <li>• Low price</li> <li>• Good wear qualities</li> </ul>	<ul style="list-style-type: none"> <li>• Not acceptable in present coin-operated devices</li> <li>• Potential for illegal duplication</li> </ul>
Multilayer Composite: 75 copper-25 nickel on copper	<ul style="list-style-type: none"> <li>• Acceptable in present coin-operated devices</li> <li>• Difficult to counterfeit or duplicate</li> <li>• Moderate price</li> </ul>	<ul style="list-style-type: none"> <li>• Requires purchase of material until Mint acquires the necessary skills to manufacture it</li> <li>• Copper colored outer rim is a departure from the appearance of present coins.</li> </ul>
80 silver-20 copper on copper	<ul style="list-style-type: none"> <li>• Much the same as 75 copper-25 nickel on copper, but faces are the same color as present coins</li> </ul>	<ul style="list-style-type: none"> <li>• Same as above, but limited by the silver supply</li> </ul>
High silver-copper alloy on low silver-copper alloy	<ul style="list-style-type: none"> <li>• Same as 80 silver-20 copper on copper, but would have no copper colored rim</li> <li>• Maintains the tradition of silver in coinage</li> </ul>	<ul style="list-style-type: none"> <li>• Limited by the silver supply</li> <li>• Requires purchase of materials until the Mint acquires the necessary skills to manufacture it</li> <li>• High price</li> </ul>

In terms of the criteria for coinage, the above array of the pros and cons of each material suggests that weights must be assigned to the importance of maintaining a tradition of silver in the coinage, effect on Mint processes, and acceptability to coin-operated devices.

The importance of tradition must be balanced against the silver supply, which will determine how much total silver can be used. The problem of changeover by the vending machine industry, multilayer composites, and Mint processes should be considered together because they are closely related. In the sections that follow, these problems are discussed from the viewpoint of the over-all consequences of various changes.

#### Limitations on the Use of Silver in Coinage

The use of silver in coinage has had a long tradition in this country and in the rest of the world. Nevertheless, the analysis of the silver supply-and-demand situation indicates that the Treasury stocks cannot last indefinitely. When the Treasury stocks have been exhausted, if silver is still a component of coinage, the Government would have to purchase silver on the open market, competing with industry for what is likely to have become a scarce commodity. Eventually, the pressures of important industrial and defense needs will probably compel the Government to abandon silver altogether. Hence, if the presently contemplated legislation regarding the composition of coinage is to be of a very long-term nature, silver should not be included in the recommended compositions.

Despite the apparent inappropriateness of considering silver as part of the long-term solution to the coinage problem, public sentiment and tradition may call for something less than total abandonment of silver at this time. In such a case, the rate of silver consumption in coinage must be selected so as to take into account the fact that the Treasury stocks are the main deterrent to a rise in the price of silver.

By preventing a rise in the price of silver, the Treasury stocks help prevent the melt down of the coinage now in circulation. For the Treasury stocks to be effective in this role, the following condition should be satisfied:

The rate of reduction of the Treasury stock should be so low that there would be little current incentive for speculative hoarding in anticipation of a price rise when the stock has run out. Ten years' life for the stock seems adequate for this purpose.

If the public could be assured that there would be no price rise for a long time to come, there would be less likelihood that the present coinage would be withdrawn for speculative reasons. Withdrawal of coins from circulation for sentimental and numismatic reasons probably would also be slowed up under these circumstances, so that Mint production might be able to meet the total demand for coins more readily.

What must the silver content of the coins be to achieve this end? According to Table 1, a silver content of 15 per cent in all coins would permit the stocks to maintain the price of silver for a period of perhaps 10 to 15 years depending on the level of coinage demand. To maintain an over-all silver content of 30 per cent would reduce the stocks to zero by the years 1971-1977, depending on the coinage demand. Paradoxically,



since it would be possible to foresee a rise in the price of silver in only 6 years if the demand were high, it is likely that high demand would be created by the incentive for speculative hoarding. Thus, the adoption of as much as 30 per cent silver in the coinage system might make it difficult to keep the present coinage in circulation. Moreover, Mint capacity would not be so high as to be able to cope with the ensuing shortage.

It thus seems that the upper limit of silver in the total coinage composition should be 15 per cent. As indicated earlier, this over-all percentage can be achieved in a number of ways, which are discussed later. Some caution must be exercised in choosing the 15 per cent silver level, because, as Table B-10 (Appendix B) shows, high industrial demand could cause depletion of the Treasury stocks by 1971.

ALTERNATIVE CHOICES FOR VARIOUS  
DENOMINATIONS OF COIN

Possible Ways in Which Some Silver Might be  
Retained in the Coinage

In the previous section, it was indicated that the total annual consumption of silver for coinage should be limited to an amount that would be equivalent to that consumed if an alloy containing 15 per cent silver were used in all subsidiary coins. Since an alloy containing 15 per cent silver is not advisable, because of unattractive color and low tarnish resistance, other ways of achieving this consumption rate have been considered.

For example, if only one coin were made of a silver alloy, the alloy could be quite high in silver content and yet not exceed the supply limitations. Since silver is being considered chiefly on the basis of tradition and the prestige it leads to the coinage system, it would seem appropriate to select the half dollar rather than the dime or quarter as the silver coin.\*

The alloy selected for the half-dollar coin would depend on the number of half dollars minted. Thus, if 30 per cent of all subsidiary coins were half dollars (on a face-value basis), the silver content of the coins could be 50 per cent. If the half-dollar were to make up only 18.7 per cent of the face value of all subsidiary coins minted, the silver content of the coins could be as high as 80 per cent.

Because the tarnish resistance of the 50 silver-50 copper alloy is low, the 80 per cent alloy would be preferred. This would necessitate fixing the number of half-dollars coined each year. In the past, the percentage of half-dollars minted has not been constant from year to year. In 1962, 1963, and 1964, about 24, 31, and 36 per cent, respectively, of the value of all subsidiary coins was in half dollars. The median value since 1950 was 23 per cent. Therefore, production would have to be limited if a high silver alloy were adopted for the half dollar.

Another possibility would be to spread the available amount of silver evenly through all the subsidiary denominations. This could be done with a multilayer composite. For example, if the outer layers of the composite contained 40 per cent silver, and the core were essentially copper, the over-all silver content could be maintained at 16 per cent. Such a combination could be used in all coin denominations and still be within the limitations placed on silver consumption.

If the outer layers of the composite consisted of an alloy containing only 40 per cent silver, the tarnish resistance would again create a serious problem. One way of improving the color and tarnish resistance somewhat is to add a small amount of zinc and nickel. Though not nearly so good as present coin silver in this respect, the alloy might possibly meet minimum standards of acceptable appearance. Appendix C points out that an alloy consisting of 40 silver-50 copper-5 nickel-5 zinc is used for coinage in

\*The consideration of alloys for the silver dollar is outside the scope of the present study. However, it is believed that, were silver dollars to be minted in amounts of 35 million pieces or less per year, they would not serve as a medium of exchange at the present time, but would be hoarded. On the other hand, if silver were removed from all subsidiary coinage, it might be desirable to begin minting silver dollars after sufficient time had elapsed to permit some relaxation of the protection afforded by the Treasury stocks.



Sweden, but that its electrical resistivity is too high to make it acceptable in eddy-current coin selectors. However, if the core of the composite were copper, the combination would have an acceptable resistivity x density product. Though the alloy would not be as easily processed to strip (prior to cladding) as is the 90 silver-10 copper alloy, its processing should not represent a great departure from present practice. More details regarding this multilayer composite are given in Appendix C.

#### Cupronickel and Multilayer Composites

In the comparison of materials from various points of view, it is seen that the cupronickel alloy has the advantage of being able to fit into the present Mint operations with a minimum of disruption. A changeover to cupronickel could be handled quickly and smoothly. On the other hand, to modify coin-operated devices to accept cupronickel would probably require several years to complete. Industry estimates have ranged from 2 to 10 years for this change.

The composite materials, on the other hand, would cause no disruption to the industries concerned with coin-operated devices. However, because the manufacture of composite strip is presently outside of the Mints' capabilities, the strip would have to be purchased.

The costs of conversion of the coin-operated devices and increased losses due to slugging should be compared with the premium paid for multilayer composites. It is difficult to estimate the cost of conversion, because there are three elements involved. The first element is the direct expenditure of funds by the operators of the machines to replace or modify the mechanisms. Estimates of the cost have ranged from \$12,000,000 to \$100,000,000 for the vending industry. The second element is the loss of business resulting from the inability of the new coins to operate a vending machine that has not been changed over. There have been no data obtained that can provide a basis for estimating these losses. On a yearly gross sales volume of \$4 billion, however, even a 5 per cent loss in gross sales is \$200,000,000. Vending-industry figures indicate slightly higher than 4 per cent profit on gross sales. Thus, a 5 per cent loss of business per year during the changeover would amount to a loss of \$8,000,000 in profit annually. Even higher losses would be expected if the present coinage did not remain in circulation. The third element in the costs of adopting cupronickel is the probable increase in losses due to slugging as long as the silver coins had to be accepted. No estimate of this increase can be made at present.

It is estimated that the additional cost to the Mint of purchasing the multilayer strip would be between 40 and 70 cents per pound. In normal years, this would amount to about \$5,000,000 per year. At current production rate it would amount to as much as \$10,000,000.

In the over-all weighing of the costs, it should be noted that the changeover costs would be temporary, while the losses due to slugging and the costs of purchasing strip would be annual costs. While no estimate of increased slugging losses has been made, it seems reasonable to suppose that these losses would be on the same order of magnitude of the increased costs of purchasing strip. Therefore, it would seem that the choice of a multilayer composite would cause less over-all inconvenience and monetary losses than would the cupronickel.

From the point of view of the Mint, an immediate changeover could be made, in a sense, by returning to the manufacture of strip for 1-cent and 5-cent coins (which is now purchased) and purchasing material for the 10-, 25-, and 50-cent coins (which is now manufactured by the Mints).

#### Other Considerations in Adopting Multilayer Composites

##### Wear

Measurements of dimes, quarters, and five-cent pieces now in circulation indicate that to insure a 30-year life for the coin before the core would show through, the clad thickness should be no less than 0.0075 inch on the dime in either the cupronickel or the silver alloy, and no less than 0.010 inch on the quarter. This minimum will permit a small amount of cladding to remain and still permit the coin to function in the eddy-current type selectors. Fortuitously, the clad thickness increases during the coining process at the highest parts of the coin, which would be subject to the greatest amount of wear. Figure 3 illustrates this fact. It shows the cross section of an experimental dime and quarter made of a cupronickel on a copper core.



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FIGURE 3. MAGNIFIED CROSS SECTION OF DIME (TOP) AND QUARTER (BOTTOM) MADE FROM CUPRONICKEL-COPPER-CUPRONICKEL MULTILAYER COMPOSITE

Note thickened area of outer layer at the high spots, and especially at the rim where the greatest amount of wear occurs initially.

Wear of the surfaces and the consequent change in the proportions of outside layers and core will affect the electrical resistivity x density product. Abrasion tests of actual coins should be made to verify the fact that the resistivity x density will remain within acceptable limits throughout the life of the coin.

##### Manufacturing the Strip

Several methods are available for industrial preparation of multilayer composites. Cold bonding, hot bonding, brazing, and explosive bonding are some of the methods that have been successful. The Mints could be adapted to perform the first three methods, though time must be allowed for the development of the necessary skills. The explosive



bonding method could be used to supply composite slabs for rerolling by the Mints in much the same manner as they now process silver-alloy slabs.

Still to be established are the manufacturing tolerances for the composite. Trial production runs by the Mints should be made to reveal any difficulties that might arise in the production of the strip.

### Weight

The weight of the new dime made from either a cupronickel on copper combination or the 40 per cent silver alloy on copper composite would be between 2.16 and 2.23 grams, compared with 2.50 grams for the weight of the present dime. In order to behave properly in all coin-operated devices, the weight of the dime should be a minimum of 2.2 grams throughout its lifetime. Apparently, therefore, some design changes, such as a thickened border, would be necessary in the dime in order to increase its total weight. A thickened edge would also be beneficial in that the amount of wear (in terms of thickness reduction) would be reduced.

### Scrap Recovery

Blanking scrap in the Mints and miscellaneous scrap in preparing the multilayer composite might amount to as much as 35 per cent by weight. The over-all composition of the scrap from the silver alloy on copper composite would be 16.52 per cent silver, 78.55 per cent copper, 2.65 per cent zinc, and 2.07 per cent nickel. The outer layers alone would contain 20.65 per cent copper. Calculations based on the copper distribution in the outer layer and in the core show that up to 26 per cent scrap could be remelted to make all the alloy needed for the outside layers. Any excess scrap would have to be refined, rather than remelted.

While this will result in a considerable amount of additional handling, the increased cost would not be great. Recovery of the metal, valued at slightly more than \$3 per pound, should not be difficult for this composition. The costs of processing to sheet and the costs of making the composite would be lost, irrespective of whether the scrap could be remelted or not.

The scrap problem with the cupronickel-copper combination is minimal. If the scrap did not exceed 33.3 per cent of the total amount of composite processed, all the scrap could be used to prepare the material for the outer layers of the composite. The excess could also be used for making the cupronickel alloy for the five-cent coin.

### The Outer Edge

The appearance of coins made from a copper-cored composite would be noticeably different from the present coinage. As discussed earlier, the distinctive red-appearing edge would be an asset in that counterfeit and illegal duplicates could be easily recognized. The anti-counterfeiting could be further enhanced, according to a suggestion made by a Mint source, by engraving the copper edge with a special design during the upsetting operation.

On the other hand, departure from the present appearance might be considered a severe disadvantage. Moreover, exposing the functional features of the coin might invite slugging by suggesting inexpensive materials capable of acceptance in present-day coin selectors.

Both the advantages and disadvantages must be considered. While the advantages may balance the disadvantages, it might be preferable to avoid the problem altogether by devising a means of obtaining an all white edge. Accordingly, the Mint should give consideration to the possibility of redesigning its upsetting tools to shape the outer edge of the blank in such a way that the coining operation covers the core material with the outside layers. Figure 4 shows the suggested procedure. Other ways are no doubt possible and should be studied.

#### POSSIBLE ECONOMIC CONSEQUENCES OF A CHANGE IN COINAGE MATERIAL

Although beyond the original scope of this study, certain approaches to lessening the impact of a coinage change on the Public, and its consequent effect on the economy should be considered.

The principal problem to be faced is the possibility that the present coinage might be withdrawn by the public. In order to eliminate the economic incentive for the public's withdrawing the present silver coins, the Treasury stocks can be used to maintain the price of silver below the point at which withdrawal and meltdown would be economic. At a minimum this will be necessary throughout the period of transition while large amounts of the new coins are being placed in circulation.

Withdrawal of the present silver coinage for sentimental reasons is much more difficult either to predict or to control. However, if a policy were to be established for not calling in the present coinage, a favorable psychological climate could be created. Publicity releases could give assurances that

- (1) The present coinage will not be withdrawn by the Government.
- (2) The silver price will not be permitted to rise for a considerable time.
- (3) A change of the coinage alloy will in no way affect the purchasing power of the coins.
- (4) The silver supply and demand situation has been reconciled and no crisis will occur.

Conversely, legislation prohibiting melt down of silver coins and prohibiting export of silver would create a climate suggesting that a problem exists. The consequences of such a climate would be to encourage hoarding of coins for both sentimental and speculative reasons.

Since the above suggestions are outside the scope of the present study, they are not included in the Recommendations.



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Using Present Method on  
Multilayer Composite



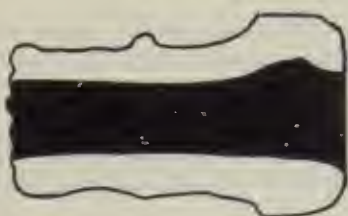
Modified Method on  
Multilayer Composite



Sheared Blank



Upset Blank



Struck Coin

FIGURE 4. A SUGGESTED MEANS FOR OBTAINING A WHITE EDGE ON A MULTILAYER COMPOSITE COIN CONTAINING A COPPER CORE

### CONCLUSIONS AND RECOMMENDATIONS

Taking into account the various criteria for U. S. coinage materials, Battelle presents the following conclusions and recommendations:

1. A multilayer composite consisting of cupronickel (or, conceivably, nickel silver) clad on a copper core used in all of the subsidiary denominations seems to offer the best over-all solution to a complicated problem. This recommendation can only be a conditional one since the Mint must determine that it will be able to obtain adequate amounts of the composite material from commercial suppliers until it develops its own capabilities in this area. Experimental strikes have produced very attractive coins but the Mint must also determine that there are no unresolved problems that would stand in the way of a large scale production effort on the new coins. Therefore, it is recommended that the Mint undertake whatever steps are required in order to establish beyond doubt the availability of the needed multilayer material and the feasibility of making large amounts of coins of satisfactory quality.

2. In the event that some unforeseen problem should disqualify the cupronickel composite material for use by the Mint, it is recommended that the new coins be made from the homogeneous 75 copper - 25 nickel alloy. A slightly less preferable, but still acceptable, alloy would be the 65 copper-18 nickel-17 zinc nickel silver. In any event, the Mint may wish to consider the eventual use of a homogeneous base alloy after a multilayer composite has provided the time needed for gradual adaptation of vending machines to accept both old and new coins.

3. The retention of some silver in the coinage is desirable on the basis of tradition and prestige if this can be accomplished without compromising the achievement of other more important objectives. Analysis of the silver supply-demand situation suggested that no more than 15 per cent of projected subsidiary coinage requirements could safely be in the form of silver. Furthermore, the possibility is recognized that even at this reduced rate of use, silver might have to be removed from our coinage altogether within 10 to 15 years. However, within these limitations, it may be adjudged desirable to continue some silver in the coinage. In such an event, and ignoring the special case of the silver dollar, there would appear to be two general options:

(a) Use the 15 per cent, or so, of silver in the 50-cent piece. In the interest of a minimum change in appearance, a multilayer could be used with 80 per cent silver clad on a lower content silver-copper core.

(b) Spread the 15 per cent, or so, of silver throughout the subsidiary denominations. In such a case, the 400 fineness Swedish alloy could be clad on a very low content silver-copper core.

Legislation establishing either of these materials could include specifications for a material containing no silver. A cupronickel (75-25)-copper (silver bearing) combination made to the same dimensions as specified for the silver alloy-copper core composite shown above could be authorized as a replacement for the silver alloy composite when the silver stocks dropped to any level decided upon, or at any given date. It is suggested that the date for the second changeover be set at July 1, 1975, and that earlier changeover be permitted if the Treasury's silver stock should drop below



45 and 46

200,000,000 ounces before that date because of unexpected demands on the stock. The amount would be arbitrary and could be decided at a later date. It would necessarily be dependent on the defense needs, outstanding silver certificates, and world silver situation.

APPENDIX A

SUPPLY-AND-DEMAND OUTLOOK FOR SELECTED METALS  
CONSIDERED AS ALTERNATIVES TO SILVER IN  
UNITED STATES COINAGE

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## A-1

## APPENDIX A

SUPPLY-AND-DEMAND OUTLOOK FOR SELECTED METALS  
CONSIDERED ALTERNATIVES TO SILVER IN UNITED STATES COINAGEIntroduction

This section discusses the adequacy through the year 2000 of 11 metals considered as possible replacements for present metals in United States coinage. These metals are:

Aluminum	Molybdenum
Chromium	Nickel
Columbium	Titanium
Copper	Tungsten
Manganese	Zinc
Zirconium	

The supply relationships presented in this analysis are based for the most part upon data published by the Bureau of Mines. Of particular value is the Bureau of Mines publication Bulletin 585\*.

These data on availability are summarized for the above metals in Table A-1. The data on silver availability are also shown for comparison. In most instances, availability represents reserves of metals in the ground, reserves being metal content of measured, indicated, or reasonably inferred ores considered extractable in terms of present economies. In contrast, resources are considered as the metal content of deposits not utilized at present prices but of sufficient grade to represent potential sources of the metal in the event of emergency-induced shortage or at higher prices induced through other scarcity.

The indicated demand upon available reserves of these 11 metals through 1980 and through the end of the year 2000 are also summarized in Table A-1. These data are based partly upon projections by Landsberg, et al.\*\* in Resources in America's Future. Subsequent sections discuss the rationale of the supply outlook for each metal summarized in Table A-1 and the degree of certainty reflected in these projections of demand.

For the United States, scarcity of a metal resource might result either through loss of foreign sources of raw-material supply upon which this country is dependent, or through the world industrial demand for the commodity exceeding production capacity and/or resource limits. In either case, scarcity is accompanied by rising price levels which for a coinage metal could result in the melting or hoarding of currency for its metal content. This is the situation this country now faces in the use of silver as a coinage metal.

\* Mineral Facts and Problems, Bulletin 585, Bureau of Mines, 1960 Edition, U. S. Govt. Printing Office, Washington, D. C.  
\*\* Landsberg, H. H., Fischman, L. L., and Fisher, J. L., Resources in America's Future, John Hopkins Press, Baltimore (1963).

## A-2

To avoid similar scarcity for an alternative coinage metal at some future time, selection of the metal must rest upon definite economic criteria. First, Free World and domestic reserves and potential resources of the metal should be sufficient to meet projected Free World demands, preferably through the year 2000, whether or not the United States is sufficiently endowed to meet its own requirements. Second, access either to reserves or potential resources must be assured under prolonged emergency conditions. Further, anticipated demands for the metal, for coinage purposes, should not induce scarcity, per se. Also, industrial users of the metal should have the economic and technological alternative of turning to more plentiful substitutes in the event of scarcity. Finally, production capability must be adequate to meet peak demands for the metal for coinage and industrial uses.

Projections of total Free World demand for these metals through the close of the century are subject to varying degrees of uncertainty. For this reason, three estimates of cumulative demand are projected: a conservative estimate, a medium most probable outcome, and a high estimate. These are then compared with Bureau of Mines estimates of availability, tempered by judgments regarding future rates of discovery and the economic potential for utilization of low-grade resources.

Aluminum

The outlook for aluminum metal, both from the viewpoint of demand and supply, appears bright. As the latest metal to find large-scale use in industry, rapid increases in demand have been accompanied by successful exploration efforts for bauxite, the preferred ore of aluminum. The expectation for continued discovery of high-grade ores also appears excellent.

Reserves of aluminum of 800 million tons, given in Table A-1, represent a yield of 1 short ton of aluminum from 4 long tons of bauxite. This conversion factor is applied to the U. S. Bureau of Mines' estimate of bauxite reserves, dated December, 1958.

Medium projections of demand for aluminum metal in the United States through the year 2000 of 255 million tons, shown in Table A-1, are based upon a projected rate of increased usage of 5.2 per cent per annum through 1980 and a rate of 4.3 per cent in the period 1980-2000.

Assuming that changes in demand for aluminum in other non-Communist countries match those of the United States, cumulative Free World consumption of aluminum metal would equal 500 million tons by the year 2000. This medium projection would utilize only two-thirds of the indicated Free World reserves of the metal. On the other hand, if consumption of aluminum in other non-Communist countries eventually exceeds that of the United States, as might be expected because of the present lower per-capita consumption in other countries, then total Free World cumulative consumption would equal or exceed present reserve estimates. This outcome is unlikely, however, because exploration could at least double present reserves of aluminum ore in the next four decades.

In the United States, domestic production supplied only 15 per cent of domestic requirements for bauxite in 1963. Most of the aluminum metal produced for consumption



## A-3

in the United States is derived from Jamaica and from Surinam ore. As shown in Table A-1, these reserves of aluminum metal contained in bauxite, plus our own limit reserves, are adequate for our needs at least through 1980. Future discoveries to supplement these reserves are most likely to be made in Australia and in Africa. It is only in the relatively well-mapped nontropical areas, such as the United States, that large discoveries of aluminum ore are unlikely.

Economic scarcity cannot be considered a handicap in the consideration of aluminum as candidate metal for U. S. coinage. Compared with total consumption, coinage requirements of even 5000 tons would have negligible effect upon supply-demand relationships. The excess Government metal stockpile is also more than adequate for short-run emergency needs. In the event of a prolonged emergency, domestic low-grade resources could supply this country's requirements for the metal, with little likelihood that the metal value of the coinage would approach its monetary value.

Chromium

World production of chromium ore has doubled on the average of every 10 years in recent decades as a result of fast-growing metallurgical refractory uses. However, nothing in the foreseeable future is likely to change this country's total reliance upon overseas sources for its needs.

Available reserves of chromium contained in chromite ores in the United States, shown in Table A-1, are in the order of 2.7 million tons. These reserves are low in  $\text{Cr}_2\text{O}_3$  content, are difficult and costly to concentrate, and are therefore undesirable for metallurgical purposes. This also applies to the other limited reserves in the Western Hemisphere.

Projection of demand for chromium in the United States (shown in Table A-1) are tied to projections of steel demand, especially the specialty steels. As shown, the medium cumulative demand in all uses is estimated at 30 million tons of chromium by the year 2000. Added to this is an estimated 110 million tons of other Free World consumption, which results in an average total Free World cumulative demand of about 140 million tons of chromium in the 40-year period.

Because of its dependence upon foreign sources for chromium ores, the United States would be faced with serious transportation problems during wartime. Emergency supplies of chromium raw materials for coinage purposes could be guaranteed therefore only through stockpiling.

In potential coinage alloys, chromium receives attention as an ingredient of both stainless steels and nickel-chromium alloys. In either case, it would not make up more than 20 per cent of the alloy. Hence, stockpiling to permit uninterrupted use during emergencies would be within the range of feasibility. However, emergency conditions, if prolonged, could place critical uses of the metal in competition for such a stockpile.

## A-4

Columbium

The first commercial use for columbium, developed in the 1930's was as the ferroalloy used in making alloying additions to steel. Since then columbium has been used in the metal form in nuclear reactors. It also shows promise for use in nonferrous high-temperature alloys for aircraft and missiles.

For many years, essentially all the columbium used in the United States was derived from African concentrates of the mineral columbite. During the Korean War, however, in response to a subsidy program, vast deposits of the columbium mineral, pyrochlore, were discovered. These are located mainly in Brazil, Africa, and Canada.

In 1958 the known Free World resources of columbium metal were estimated by the Bureau of Mines to be about 10 million tons\*. These resources were predominantly located in South America (7.9 million tons), most of which was in a single deposit in Brazil. North America accounted for 1 million tons of columbium, of which 250,000 tons was in the United States and the rest in Canada.

The largest use of columbium has been in ferrocolumbium, which is used as an addition to stainless steel. No large production-scale uses have yet been established for columbium metal, either in high-temperature alloys or nuclear applications.

There was no domestic mine production of columbium concentrate in 1962, although 64 tons of columbium metal were produced from imports and stocks. In terms of metal content, 1,895 tons of columbium were consumed in the United States in 1962. Of this, 85 per cent was as ferrocolumbium.

Industry representatives report that present mine and mill ore-concentrate capacity is rated at about 700 tons of contained columbium metal in Canada and 2,500 tons in South America. It is estimated that within 2 years Free World mining capacity could be expanded to produce additional ore containing 5,000 tons of the metal annually to meet demands for coinage if this metal were chosen for such service. Interim demand could be met from Government stockpiles of raw materials, which contain an estimated 5,000 tons of columbium metal.

Present extraction capacity in the U. S. is thought to be about 1,400 tons annually, while capacity for reduction of the oxide is in excess of 1,000 tons annually. The consensus of industry is that capacity for the reduction of 5,000 tons of columbium per year could be realized within 1-1/2 years. Melting and forging capacity are considered adequate for any projected demands for the metal. However, annealing of columbium requires special high-temperature vacuum furnaces. Presently, the total U. S. capacity for this type of annealing is only 500-750 tons per year. Sufficient annealing capacity could be made available in 1-1/2 years.

Columbium is quoted at about \$50 a pound, although going market prices are considerably below this. One producer suggests \$18-\$20 per pound as the present selling price for quantity orders.

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\* 13 million tons of contained  $\text{Cb}_2\text{O}_5$  (containing 79 per cent columbium) in total Free World resources.



## A-5

It is expected that the price of columbium will decrease in the future as volume of production increases. Industry representatives contacted believe that, with a market for 5,000 tons or more of the metal, the price of sheet or strip product would ultimately be in the range of \$12-\$13 per pound. The value of revert scrap, it is estimated, would probably range from \$1 to \$3 per pound.

Future demand for columbium depends partly upon the outcome of technological developments that will affect its cost of production and partly upon research and development which might extend its application. Therefore, any projection of future demand at this stage would be subject to a high degree of uncertainty. All that can be said is that considerably more columbium is available in known resources than will be required in the foreseeable future.

Foreign supplies of columbium are vulnerable to political and emergency uncertainty. In view of this risk, one must give special emphasis to the North American resources. Probably these would be adequate to provide the needs for coinage and accelerated industrial uses if other supplies were cut off.

Copper

The United States has long been the largest copper-producing and consuming country in the World. However, since World War II this production has been insufficient to meet the accelerated demands, and imports have been required to meet about 25 per cent of this country's needs.

Official estimates based upon Bureau of Mines statistics published in the 1960 edition of Mineral Facts and Problems place United States reserves of copper at 32.5 million tons. Landsberg, et al., suggest that U. S. reserves of copper, taking into consideration additional ores not included in the Bureau of Mines estimate, may be on the order of 40 to 50 million tons. A further reliable reserve is to be found in the estimated 30 million tons of recoverable copper-in-use in the United States.

Other reserves of new copper include about 66 million tons in the Western Hemisphere, with Chile alone accounting for 46 million tons. Total Free World reserves inclusive of the United States are estimated to be 153 million tons of copper. An additional 100 million tons of inferred ore is also thought to exist in Chile and in Africa.

Medium projections of cumulative copper consumption in the U. S. during the 1960-1980 period are estimated by Landsberg to be 42 million tons, and 112 million tons for the 1960-2000 period. To this should be added foreign demand in non-Communist countries of between 350 and 550 million tons, for an average Free World cumulative demand of about 560 million tons in the next four decades.

Although known and inferred copper reserves do not balance this projected demand for Free World copper, there are compensating factors. Indications are that low-grade foreign ores not included in the estimates are of a grade higher than that mined in the United States today. Additionally, new discoveries, or the substitution of aluminum for copper, could make up the deficit. The figures do indicate, however, that the United States may rely increasingly upon foreign sources to meet projected domestic demands.

## A-6

As an alloy substitute for silver in United States coinage, it seems unlikely that the metal value of copper would ever exceed the monetary value, at least in coins of larger denomination. (Table A-2, at the end of this Appendix, shows the price of copper relative to silver.) Then, too, the amount of copper required for coinage is quite insignificant in relation to overall copper demand. However, war-induced scarcity would possibly require that an adequate stockpile of copper be maintained for coinage purposes.

Manganese

Although manganese is indispensable as a ferroalloy addition in steel-making, commercial reserves of the ore in the U. S. are limited. Because of this, the United States is faced with the problem of finding an economical means of utilizing large low-grade resources for emergency purposes.

In the 1960 edition of Mineral Facts and Problems, the Bureau of Mines estimates that world reserves of manganese ore are in the order of 1 billion tons. Two-thirds of this is in the Communist countries with the remainder in India, Brazil, Union of South Africa, and Gabon.

A summary of information regarding contained manganese in these Free World deposits is shown in Table A-1. As shown, the Free World manganese reserve is on the order of 185 million tons, with less than 1 million tons available domestically. The manganese content of low-grade manganese resources available in this country, however, is estimated to be on the order of 77 million tons.

The projections of cumulative demand for manganese shown in Table A-1 are correlated with projections of steel production. For the United States, estimated cumulative demand for contained manganese in manganese ores through the year 2000 is 73 million tons. Assuming that steel production increases at a rate of 5 per cent annually in other Free World countries, an additional 225 million tons of manganese will be required in the four-decade period. The resulting deficit between world demand and supply could likely be accommodated by slightly lower grade resources and improved beneficiation techniques. Ocean-floor deposits and new discovery possibilities also offer promise of relieving the long-term supply situation.

From the foregoing it is evident that high-grade manganese ores for production of metal for coinage are strategically in short supply in the United States. Stockpiling of high-grade ores or electrolytically refined metal might therefore be required to meet emergency-induced shortages of the metal. However, low-grade resources could likely alleviate any prolonged shortage of the metal for defense as well as coinage needs.

Molybdenum

In recent years suppliers have been hard pressed to meet rising demand for molybdenum, either as a metal or as an additive in steelmaking. However, large-scale exploration has greatly improved the supply outlook for the metal lately.



## A-7

Most of the world's supply of molybdenum is restricted to the Western Hemisphere. This combined reserve is considered to be in excess of 2 million tons, of which over half is in the single Climax Molybdenum deposit in Colorado. Most of the remaining reserve is recovered as a by-product of copper ores mined in the Western states and in Chile.

Projections of demand for molybdenum, shown in Table A-1, are related to rising steel production and possible space-age needs. Allowing for both domestic consumption and exports upon which the rest of the Free World is dependent, medium cumulative requirements might exceed 3 million tons of molybdenum by the year 2000.

These projections suggest that, even at the medium level of demand, a supply problem could develop in the latter part of the century. Adequacy, therefore, will depend upon recent and future discoveries. Greater recovery of by-product molybdenite from copper ores might also alleviate the long-term supply situation.

Molybdenum ranks high on the list of candidate metals for coinage in terms of economic potential. Because the Western Hemisphere is well endowed with the metal, sources of the metal would be available during emergency periods. However, with one-third of future supply expected to be obtained as a by-product of copper mining, major fluctuations in copper production could create supply problems. Also, coinage would constitute one of the single largest markets for a metal such as molybdenum. It is likely that production could not easily accommodate this added demand, especially during peak periods of economic activity.

Nickel

Despite shortages induced by emergencies in two recent wars, the outlook for enough nickel to meet requirements seems satisfactory. With the exception of Cuba, the world's largest known reserves of nickel are located in Canada in the provinces of Ontario and Manitoba. Of the 6 million tons of Canadian nickel reserves shown in Table A-1, the International Nickel Company controls 4 million tons. Other important Free World reserves are in New Caledonia, the Philippines, and in Puerto Rico.

Reserves in the United States, located in Oregon and Alaska, are estimated to contain about 500,000 tons of nickel. These deposits, however, have supplied only about 15 per cent of United States requirements in recent years, almost entirely for defense stockpiles. It is considered unlikely that economic incentives would add measurably to these United States reserves.

United States nickel consumption, which was 124 thousand tons in 1963, is projected to increase fivefold by the year 2000. This constitutes a cumulative demand of nearly 12 million tons of nickel in the period. Assuming a slightly faster growth for steel production in other countries, Landsberg projects other Free World consumption to accumulate to about 25 million tons.

These requirements are three times the present known reserves listed in Table A-1 but are about equal to resources plus reserves. It is likely, therefore, that a transition to lower grade ores in the future will be necessary. Development of the Cuban laterite ores prior to expropriation has demonstrated the feasibility of this.

## A-8

There is, of course, the expectation of additional discoveries of nickel sulfide ores in Canada of the Sudbury type as well as the extension of reserves of known deposits in Canada. The outlook for nickel sufficiency is therefore at least as good or better than for most of the other candidate coinage metals.

Titanium

The titanium metal-producing industry was initiated in the early 1950's in response to Government stimulation to meet military needs. These followed a period of rapid growth in which world production of titanium sponge metal reached 17,000 tons by 1957. Subsequently, with an abrupt change in defense effort away from use of titanium metal in manned aircraft, production slumped to less than one-fourth of production capacity.

In the 1960's, new uses for titanium in aircraft and missiles began to develop, and applications in new fields were established through research and development. Accordingly, world production of titanium sponge had risen to a level of nearly 10,000 tons in 1963 in response to a market that shows promise of continued growth.

The mineral generally used for making titanium sponge is rutile, although ilmenite and altered ilmenite might be considered suitable under conditions of scarcity. Rutile is the preferred ore for sponge production because of its high titanium content (94 per cent  $\text{TiO}_2$ ), its lack of iron, and the fact that it lends itself to direct chlorination in the process of sponge production.

In contrast to ilmenite, domestic reserves of rutile ore are small (see Table A-1), and the mineral base for future expansion of production is limited at present. The United States is dependent upon Australia to supplement domestic production of rutile.

A new venture for the recovery of rutile is that of Sherbro Minerals Ltd., located in Sierra Leone. Early estimates suggest that these reserves are on the order of 30 million tons of high-grade rutile, a figure which exceeds all other comparable reserves in the world. This deposit alone is capable of supplying the world's demand for titanium metal ores for an indefinite period\*.

Titanium metal production capacity in the United States is thought capable of meeting coinage requirements for the metal.

In the event of loss of foreign sources of rutile, domestic suppliers of the metal would be forced to turn to ilmenite or high-titanium-bearing slags as domestic rutile reserves were exhausted. The inconvenience of using these resources might result in increased metal costs. However, domestic resources are adequate for foreseeable needs.

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\*African News Digest, July, 1964.



A-9

Tungsten

Having the highest melting point of all the metals, tungsten is essential in many space-age and industrial applications where extremely high temperatures are encountered. This, together with increasing use as an alloying agent in steel, accounts for much of its demand. Thus, increasing demand for tungsten as a metal and as an alloy is assured. Although domestic reserves of tungsten are adequate for this short-run need, long-term adequacy is in some doubt.

Known resources of tungsten in the United States are estimated by the Bureau of Mines to contain about 71,000 tons of tungsten metal. Except where recovered as a by-product, most of these domestic reserves are submarginal.

Total Free World reserves of tungsten are estimated to contain about 320,000 tons of tungsten metal. Although these reserves are widespread, the United States is probably better endowed than any other Free World country. In comparison, reserves of tungsten in China, North Korea, and the U.S.S.R. may be three to four times as great as the combined Free World reserve.

Projections of cumulative demand for tungsten by Landsberg, et al., shown in Table A-1, are based upon unchanged relative use of tungsten per ton of steel produced and constant use in relation to industrial machinery output. The medium projection of U. S. demand through the year 2000 exceeds Free World reserves by about 35 per cent. Assuming that Free World demand rises at the same rate as that of the United States, cumulative demand for the non-Communist countries, inclusive of the United States, might total 1 million tons, equal to about three times reserves.

This projected scarcity of tungsten may be alleviated somewhat by new discoveries, especially in less-thoroughly-explored areas than the United States. Improvements in technology may also permit exploitation of lower grade deposits, the extension of known reserves, and new efficiencies in the recovery of scrap. However, as Landsberg points out, discoveries of large deposits of tungsten, or substitution of other metals for tungsten, will be necessary by 1980 if cost increases and reduced use of tungsten are to be avoided.

The outlook under emergency conditions is less encouraging. Because it is essential to defense purposes and is in short supply, tungsten has been designated a strategic mineral for stockpiling under Public Laws 520 and 774.

Even under various types of incentives, as with the Government-sponsored purchase program, 1951-1956, 4 years were required before peak production was attained. Also, metals that might substitute for tungsten in an emergency, such as molybdenum, might also be in tight supply. It is apparent, therefore, that in an extended period of emergency, use of the metal for coinage might contribute to a shortage of tungsten for strategic and more critical needs. Small amounts used for alloying might be permissible, however.

## A-10

Zinc

Since World War II, the United States has relied upon foreign sources of zinc to supplement domestic production to meet expanding industrial and military demands, a trend that has been accentuated by the decline in domestic mine production of the metal.

Zinc is widespread in occurrence, with important Free World production coming from the United States, Canada, Mexico, Argentina, Peru, Finland, West Germany, Italy, Spain, Sweden, Japan, Morocco, the Congo, Rhodesia, and Australia. Total reserves of measured and indicated ore in these and other Free World countries is 72 million tons. The Bureau of Mines judges that additional reserves of inferred ore would at least double the reserve figure for zinc.

Cumulative projections of demand by Landsberg, shown in Table A-1, indicate that United States requirements for zinc in the four decades, 1960-2000, of 69 million tons alone equals or exceeds total Free World reserves of recoverable zinc in measured, indicated, and inferred ores. When other Free World needs for zinc are taken into account (which are at least 50 million tons in the next 40 years at present levels of consumption), the data suggest that a serious deficiency in zinc will result.

The seriousness of this supply-demand situation is mitigated somewhat by the probability that the inferred reserve estimates are on the low side. Improved recovery techniques might also relieve the supply situation somewhat. Nevertheless, the outlook for sufficiency of zinc to meet world demands through the year 2000 is in doubt.

From the standpoint of self-sufficiency for monetary needs in periods of emergency, it is worth noting that more than one-half the world's reserve of zinc is in the Western Hemisphere. Domestic mine output is also a significant factor in supply, and Canada and Mexico are important sources of imports. Zinc from old and new scrap, which yields about 20 per cent of the zinc supply, is an important secondary source of the metal. It should also be noted that the U. S. Government has eliminated zinc from its stockpile objectives. As a result, the stockpile has an excess of 1.5 million tons in inventory.

These data suggest that adequacy of supply should not be considered as any drawback in the consideration of zinc as a minor alloying element for monetary uses.

Zirconium

The source of this metal is the mineral zircon. Most of the commercial zircon is recovered as a by-product in the separation of ilmenite and rutile from black sands in which zircon is a minor constituent. Over one-half of U. S. reserves are associated with Florida ilmenite reserves and production.

As shown in Table A-1, reserves of zirconium in zircon, both in the United States and in the Free World, are quite large. The Bureau of Mines estimates that at present consumption rates the measured reserves of zirconium alone are sufficient for at least 100 years.



## A-11

Over one-half of the 50,000 tons of zircon sold each year is used in the original mineral form. The remainder of the zircon is used in manufacturing zirconium metal, alloys, and compounds. Most of the zirconium metal produced is for use in cladding of fuel elements in atomic reactors, although a small quantity finds application in ferrous and nonferrous alloys. In recent years, total demand for the metal has been less than 1,000 tons annually.

Availability of zirconium in reserves in the U. S. is sufficient for conceivable needs should this metal be selected for a coinage material. However, increases in metal-extraction facilities would be needed.

A-12

TABLE A-1. REQUIREMENTS AND AVAILABILITY OF SELECTED METALS - 1960 TO 2000

	Ag	Al	Cr	Cb	Cu	Mn	Mo	Ni	Ti	W	Zn	Zr
	1960											
	Indicated Reserves(a), millions of tons											
Availability												
United States	0.026	13	2.7	0.25	32.5	0.9	1.5	0.5	0.63	0.071	13.5	8.0
Canada	0.023	--	1.0	0.75	7.0	--	0.25	6.0	0.028	0.028	16.7	
Other	154	--	--	--	0.7	--	--	--	--	--	6.8	
Total North America	167	167	3.7	1.00	40.2	0.9	1.75	6.5	0.099	0.099	37.0	
Other Free World	633	179.0	5.50	5.50	112.8	185.0	0.50	4.5	5.5	0.222	35.0	17.0
Total Free World	0.170	800	186.0	6.50	153.0	185.9	2.25	11.0	5.8	0.321	72.0(d)	25.0
Free World-Other Resources(b)	--	1000			100.0	77		25.0	90.0	0.300	47.0	
	Indicated Demand, millions of tons											
Requirements - United States Annual												
Domestic Consumption												
1960	0.005	2.0	0.36	0.001	1.60	1.05	0.031	0.108	0.005	0.006	1.20	0.001(e)
1980 Medium	0.011	5.6	0.68		2.61	1.75	0.052	0.262	0.025	0.010	1.78	
2000 Medium		14.7	1.30		4.62	2.89	0.151	0.563		0.021	3.24	
Cumulative Demand(f)												
1960-1980 Low	0.240(c)	51	8		31	22	0.46	2.8		0.11	22	
1960-1980 Medium	0.345	73	10		42	28	0.65	3.7	0.23	0.15	28	
High	0.390	113	13		52	35	0.86	4.9		0.21	36	
Low		140	20		60	48	1.40	7.0		0.25	50	
1960-2000 Medium		255	30		112	73	2.56	11.7		0.46	69	
High		480	44		181	107	4.18	19.3		0.80	126	
Total Free World - Medium 1960-2000		500	140		560	225	3.00	37.0		1.00	175	

(a) Reserves - contained metal in measured, indicated, or inferred ores.

(b) Resources - contained metal in deposits not utilized at present prices but which are of sufficient grade to represent potential ores.

(c) Industrial use plus coinage for Total Free World. The low rate is based on complete elimination of silver in U. S. coinage; the medium rate includes continued demand for 90% silver coins at the 1963 level; the high rate includes demand for 90% silver coins at full mint capacity.

(d) Measured and indicated reserves only. Inferred ores are considered equal to these reserves.

(e) Zirconium sponge metal.

(f) Projected levels of demand. Medium is most probable.



A-13 and A-14

TABLE A-2. RECENT MARKET PRICES FOR METALS BASED UPON WHOLESALE QUANTITIES OF MELTING STOCK

Metal	Density, g/cm <sup>3</sup>	Wholesale Price, \$ per pound	Density-Adjusted Price <sup>(a)</sup> , \$ per pound
Silver	10.5	\$18.852	\$18.85
Aluminum	2.7	0.245	0.06
Chromium	7.2	1.190	0.81
Columbium	8.6	12-13 <sup>(b)</sup>	9.80 - 10.70
Copper	8.9	0.340	0.29
Manganese	7.4	0.317	0.23
Molybdenum	10.2	3.650	3.54
Nickel	8.9	0.790	0.67
Titanium	4.5	1.320	0.57
Tungsten	19.3	2.750	5.05
Zinc	7.1	0.150	0.10
Zirconium	6.5	12 <sup>(c)</sup>	7.45

(a) A pound of a metal that is of lower density than the density of silver will make more coins than can be made from a pound of silver. The cost of a given number of coins made from silver or any other metal can be compared if the price per pound is multiplied by the ratio  $\frac{\text{density of the metal}}{\text{density of silver}}$ . Hence, metal

$$\text{price} \frac{\text{density of the metal}}{10.5 \text{ g/cm}^3} = \text{density adjusted price.}$$

(b) Eventual price for sheet for the large quantities needed for coinage, according to industry estimates.

(c) Sheet price.

APPENDIX B

SILVER SUPPLY AND DEMAND

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## B-1

## APPENDIX B

SILVER SUPPLY AND DEMAND

Silver has been prized and sought for some 5 or 6 thousand years. During this time, it has been used in the arts and as a medium of exchange. In recent times, the metal has won broad usage in industry, and it appears destined to play an increasingly important role in the space age and in national defense in the years ahead.

Since World War II, world consumption of silver has exceeded production, the deficit having been drawn from stocks. Most recently, the depletion of this stock has been accelerated through rising industrial needs accompanied by burgeoning coinage requirements in the United States. This situation, coupled with inelastic production potential and limited reserves, has precipitated an imbalance in supply which demands corrective action.

About two-thirds of the silver consumed in the Free World has been for industrial uses (arts and industry). The rest is utilized in coinage. As shown below, consumption by the arts and industry in the 1963 calendar year was nearly balanced by production. However, use of silver in coinage contributed to a Free World deficit of about 210 million ounces:

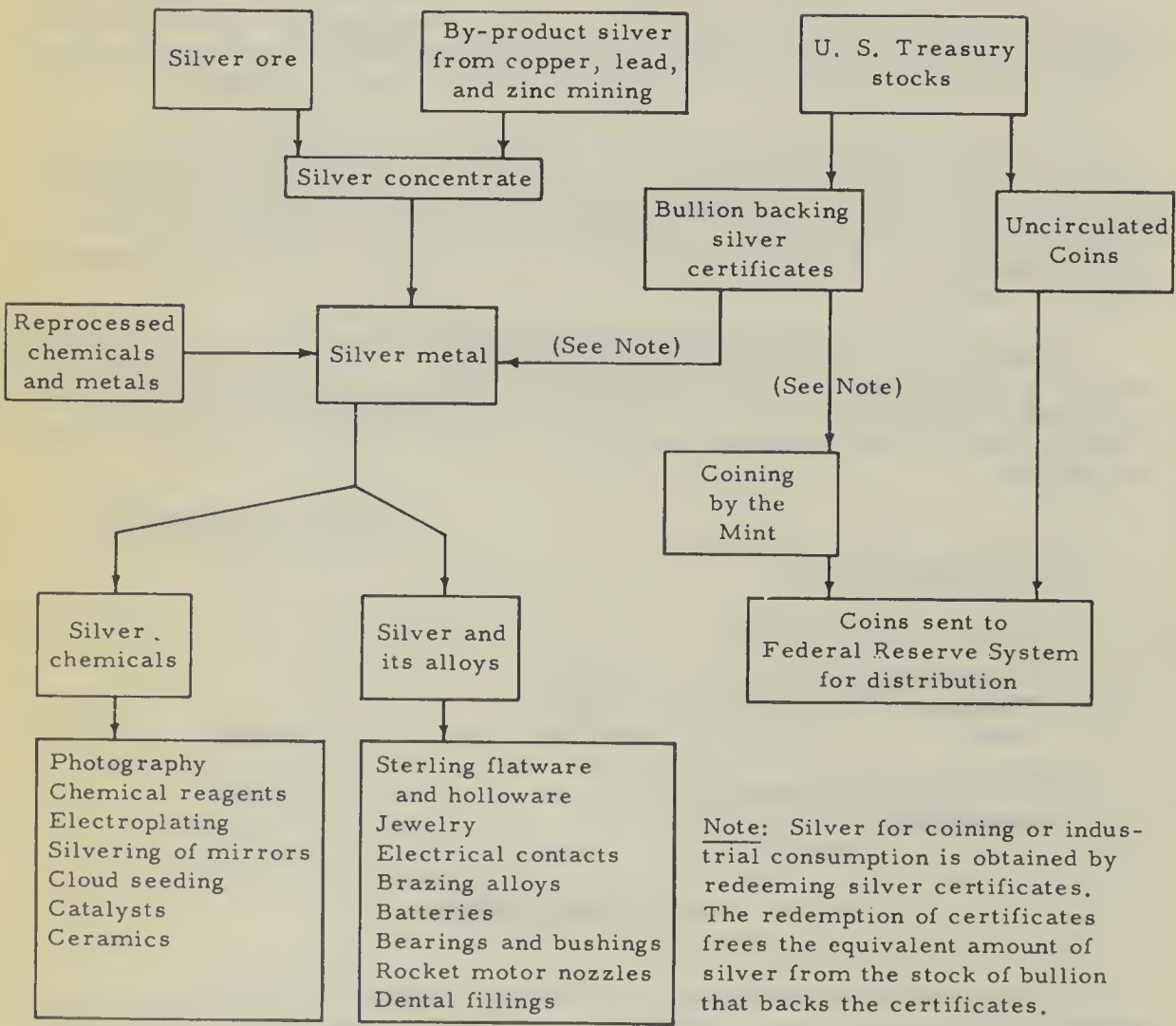
		<u>Millions of Troy Ounces</u>
Free World production		210.5
Free World consumption		
The arts and industry	247.0	
Coinage	172.2	
Total	419.2	<u>419.2</u>
Deficit (production minus consumption)		(208.7)

Silver Requirements

Silver is one of the noble metals, a designation technically referring only to its superior corrosion resistance. However, silver has other qualities that make it desirable and useful both in industry and in coinage, namely, high malleability and ductility and attractive color and finish. Its properties of high thermal and electrical conductivity account for much of the growing industrial demand for the metal, while the largest industrial demand has long been in photography, where silver compounds are used because of their superior sensitivity to light.

Figure B-1 shows the primary uses of silver and its compounds and the sources from which silver is obtained.

B-2



Note: Silver for coining or industrial consumption is obtained by redeeming silver certificates. The redemption of certificates frees the equivalent amount of silver from the stock of bullion that backs the certificates.

FIGURE B-1. TODAY'S FLOW OF SILVER FROM VARIOUS SOURCES TO THE PRINCIPAL CONSUMERS



## B-3

Use of Silver in Industry  
and in the Arts

Statistics regarding actual amounts of silver used in the industrial applications shown in Figure B-1 are unavailable. However, reasonable estimates based upon partial data for the United States provide information regarding major uses for the year 1962. These are presented in Table B-1.

TABLE B-1. NET SILVER CONSUMED IN THE ARTS AND INDUSTRY  
IN THE UNITED STATES IN 1962

Industrial Applications	Millions of Ounces	Per Cent
Photographic processes	33.0	30.0(a)
Solders and brazing alloys	25.0	23.0(a)
Electrical contacts	20.0	18.0(a)
Batteries	5.0	4.5(a)
Silver cyanide for plating	2.0	2.0(b)
Sterlingware and other	<u>25.4</u>	<u>22.5(b)</u>
Total	110.4	100.0

(a) "Silver Price May Rise Still Higher", Chemical and Engineering News, February 4, 1963, p 28.

(b) Estimate.

The Bureau of Mines estimates that industrial consumption of silver in the U. S. in 1963 was 110 million ounces, unchanged from the previous year.\* New silver used in photographic processes continued at about the same level as in the previous year, as did silver used in brazing alloys for metal joining. A moderate decline in the use of silver in sterling silverware was registered, however. Increased efforts to develop new substitutes and to use silver more economically in many applications has contributed, at least temporarily, to the leveling off of industrial silver demands in this country.\*\*

Appreciable increases in silver used in the electric and electronic fields were registered in 1963, probably offsetting declines in other fields. Consumption of silver for defense purposes such as rocket nozzles and batteries increased to more than 8.5 million ounces in 1963.

Miscellaneous applications for silver include dental alloys, glass coatings for medical and scientific equipment, water de-salting kits, and silver-plated bearings. Many promising research projects for silver applications have also been announced in 1964.

Figure B-2 and Table B-2 provide information concerning industrial consumption of silver in the United States and in the Free World for the period 1950 through 1964.

\*Reprint from Bureau of Mines Minerals Yearbook, 1963, U. S. Government Printing Office, Washington, D. C., "Silver" (J. P. Ryan).

\*\*Handy and Harman report that the total consumption of silver in industry and the arts in the United States and in the other Free World countries in 1964 was up 11 and 15 per cent, respectively, compared with 1963.

B-4

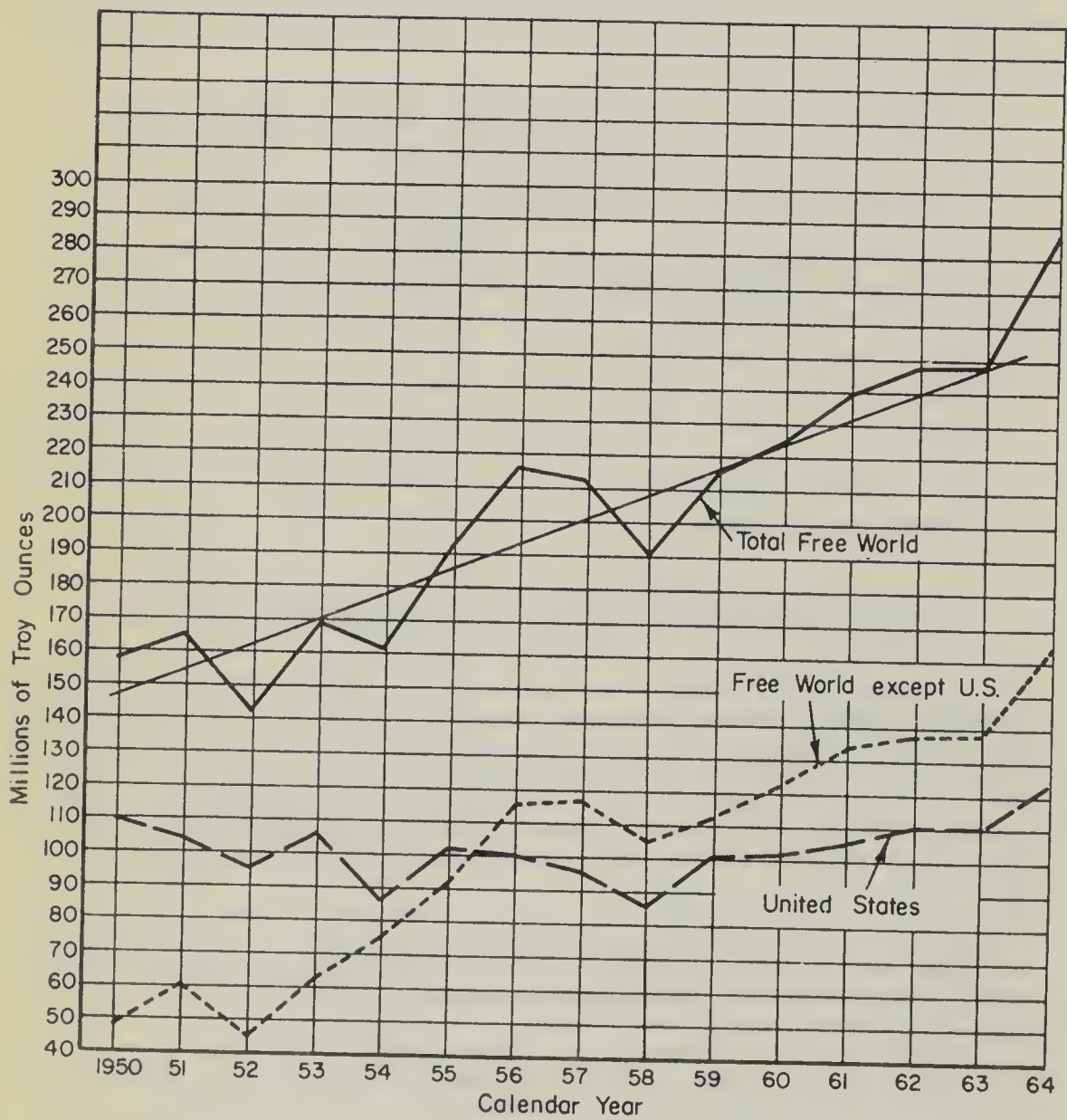


FIGURE B-2. ESTIMATED QUANTITY OF SILVER USED IN INDUSTRY AND THE ARTS IN THE UNITED STATES AND IN THE FREE WORLD DURING THE CALENDAR YEARS 1950-1964



B-5

TABLE B-2. ESTIMATED QUANTITY OF SILVER USED IN INDUSTRY  
AND THE ARTS IN THE UNITED STATES AND IN THE  
FREE WORLD DURING THE CALENDAR YEARS  
1950-1964(a)

Calendar Year	Consumption, millions of troy ounces		
	United States	Other Free World	Total Free World
1950	110.0	47.4	157.4
1951	105.0	60.0	165.0
1952	96.5	45.6	142.1
1953	106.0	62.3	168.3
1954	86.0	74.8	160.8
1955	101.4	91.4	192.8
1956	100.0	115.9	215.9
1957	95.4	117.2	212.6
1958	85.5	105.0	190.5
1959	101.0	111.9	212.9
1960	102.0	122.6	224.6
1961	105.5	134.0	239.5
1962	110.4	137.4	247.8
1963	110.0	137.0	247.0
1964	123.0	162.9	285.9

(a) 1950-1963 data are taken from: various editions of the Minerals Year Book. 1964 data are reported in The Silver Market in 1964, Handy and Harman, New York.

## B-6

As shown, total Free World use of silver in industry and in the arts has risen from about 150 million ounces in 1950 to 250 million ounces in 1963, an average rate of about 4.0 per cent per annum compounded. The figure shows that most of this increase was accounted for by countries other than the U. S. In contrast, consumption of industrial silver in this country has been quite level since 1950 at between 90 million and 110 million ounces per year.

Expectations are that industrial demand for silver in the Free World will continue to increase in the future despite the recent price rise in the metal to \$1.2929 (an ounce) from \$.925 in 1961. Despite the fact that the use of nonsilver light-sensitive materials in the photographic industry has risen significantly in recent years, the market for silver chemicals in photography is not threatened. Space-age applications and new developments offer significant potential for increased use of silver which should offset declines attributable to substitution or to reduced retail sales.\* Therefore, a 2 per cent minimum annual increase in future Free World silver consumption is considered reasonable — perhaps on the low side — for estimation purposes.

#### Use of Silver for Monetary Purposes

Since passage of the Gold Reserve Act in 1900, silver has played a secondary, though important, role in our monetary system. The metal has been used in subsidiary coins (dimes, quarters, and half-dollars) and in silver dollars, and serves as backing for some 1.2 billion dollars worth of silver certificates in circulation. Altogether, however, silver accounts for less than 3 per cent of the U. S. stock of money.\*\*

Figure B-3 and Table B-3 show the consumption of silver for coinage in the United States and in the Free World for the period 1950 through 1963. The data show that in 1963 the United States accounted for 65 per cent of total Free World coinage as compared with 55 per cent in 1962 and 40 per cent in 1961. As shown, silver used in coinage in the rest of the Free World has declined since 1961, although the trend until 1961 was upward.\*\*\* In contrast, silver minted in United States coinage in 1963 increased 34 million ounces from 1962, a gain of 45 per cent. A further gain of 90 million ounces is expected in 1964.

The trend toward demonetization of silver in other Free World countries is continuing.\*\*\*\* For estimation purposes it is assumed that the amount of silver used for coinage in the rest of the Free World will decline to about 30 or 40 million ounces by 1970 from the present level of 60 million ounces.

Projections by the U. S. Treasury indicate that, if the present scarcity of coins persists, the amount of silver required for United States coinage in calendar year 1965 will be about 290 million ounces,\*\*\*\*\* up from 201 million ounces in 1964. Should

\*Silver nitrate, the base for much of the silver used in industry, offers one measure of demand for silver used in the United States. Based upon the content of silver in this compound (63.5 per cent), this use has shown a steady increase from about 35 million ounces in 1950 to 55 million ounces in 1963, a compound rate of increase of about 4 per cent each year. This growth might be slowed somewhat due to the growing use of color film, which utilizes less silver than black-and-white film and offers higher recovery of silver used.

\*\*"The New Silver Law", Monthly Review, Federal Reserve Bank of Richmond (July, 1963).

\*\*\*Total use of silver for coinage rose in 1964, primarily because Japan issued a silver Olympic Games commemorative coin.

\*\*\*\*Australia and South Africa are planning to abandon silver in 1965.

\*\*\*\*\*This forecast represents short-run cyclical demand for about 8-9 billion coins. The silver consumption is based on the 90 silver-10 copper alloy. In the long run, the Arthur D. Little forecast of 4-5 billion coins annually is considered more appropriate.



## B-7

coinage demand continue to increase in this country, the United States Mints, working at capacity, might continue production at the 1965 level into 1967, when production could be increased further as the new Philadelphia Mint begins operation. The rate of increase in coinage demand is approximately the same for both silver-containing and non-silver-containing coins (see Figure B-4 and Table B-4). This suggests that much of the present demand for silver coins is in response to real economic growth, intensified by above-normal interest by speculators and coin collectors. It is possible, therefore, that short-run coinage demand could follow a cyclical pattern as it has historically. Thus, it is possible that a down-turn in demand for subsidiary coins could develop by mid-1965.

Sources of SilverProduction

World production of silver in 1960 was estimated as 249.5 million troy ounces. Of this, some 39 million ounces was produced in Communist countries. Of the remaining 210 million ounces, which represent Free World production, 53 per cent was mined in North America, 22 per cent in South America, 8 per cent in Europe, 3 per cent in Africa, 9 per cent in Oceania, and about 5 per cent in Asia.

Mexico, which has long been the leading producer of silver, accounted for 42.8 million ounces of silver in 1963. The second largest producer was Peru with 36.4 million ounces. The United States was third with 35.0 million ounces, followed by Canada with 30.7 million ounces of newly mined silver.

The silver mined in the Free World is commonly produced as a by-product or co-product of copper, lead, and zinc. Two-thirds of the domestic silver mined is recovered as a by-product of these ores. Virtually all of the remainder comes from siliceous silver vein deposits, and only 0.1 per cent of all production is from placer mining.

Figure B-5 and Table B-5 show the trend of silver production in the United States and in the Free World since 1950. As shown, production of silver in the United States has declined in the 14-year period at an average annual rate of about 1 per cent. In contrast, total Free World silver production (including the United States) has risen from 170 million ounces in 1950 to 210 million ounces of silver produced in 1963, an average rate of increase of 1.5 per cent each year.

Because most of the silver produced in the Free World is derived from base-metal ores, silver output is relatively inelastic as a function of price. Liberalized exploration subsidies and higher prices have stimulated exploration and marginal mine production of silver or silver-containing base-metal ores. Nevertheless, projections of future silver production must be based largely on expectations of demand for copper, lead, and zinc.

Silver producers estimate that at least 38 million additional ounces of silver will be produced by 1968. For estimation purposes in this report, it is assumed that Free World production of silver will increase 48 million ounces per year by 1968, to

B-8

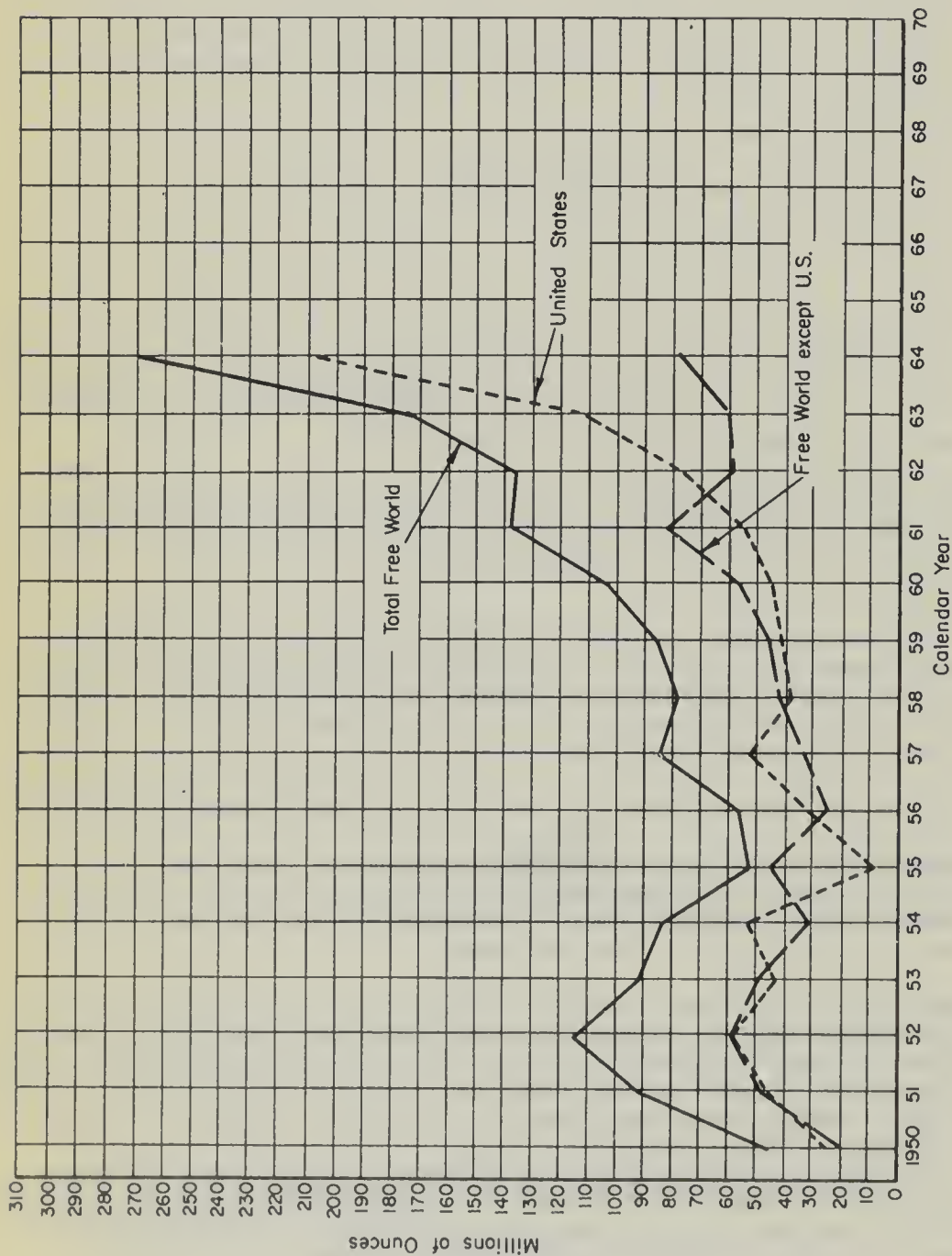


FIGURE B-3. QUANTITY OF SILVER USED IN COINAGE IN THE UNITED STATES AND IN THE FREE WORLD DURING THE CALENDAR YEARS 1950-1964



B-9

TABLE B-3. QUANTITY OF SILVER USED IN COINAGE IN THE  
UNITED STATES AND FREE WORLD COUNTRIES  
DURING THE CALENDAR YEARS 1950-1964

Year	Consumption, millions of troy ounces		
	United States	Other Free World	Total Free World
1950	24.6	19.5	44.1
1951	44.4	46.1	90.5
1952	57.3	57.0	114.3
1953	42.8	47.9	90.7
1954	53.2	30.2	83.4
1955	8.2	44.4	52.6
1956	31.4	25.3	56.7
1957	52.1	32.3	84.3
1958	38.1	41.4	79.5
1959	41.4	45.0	86.4
1960	46.0	57.9	103.9
1961	55.9	81.2	137.1
1962	77.4	59.0	136.4
1963	111.5	60.7	172.2
1964	203	67	270

B-10

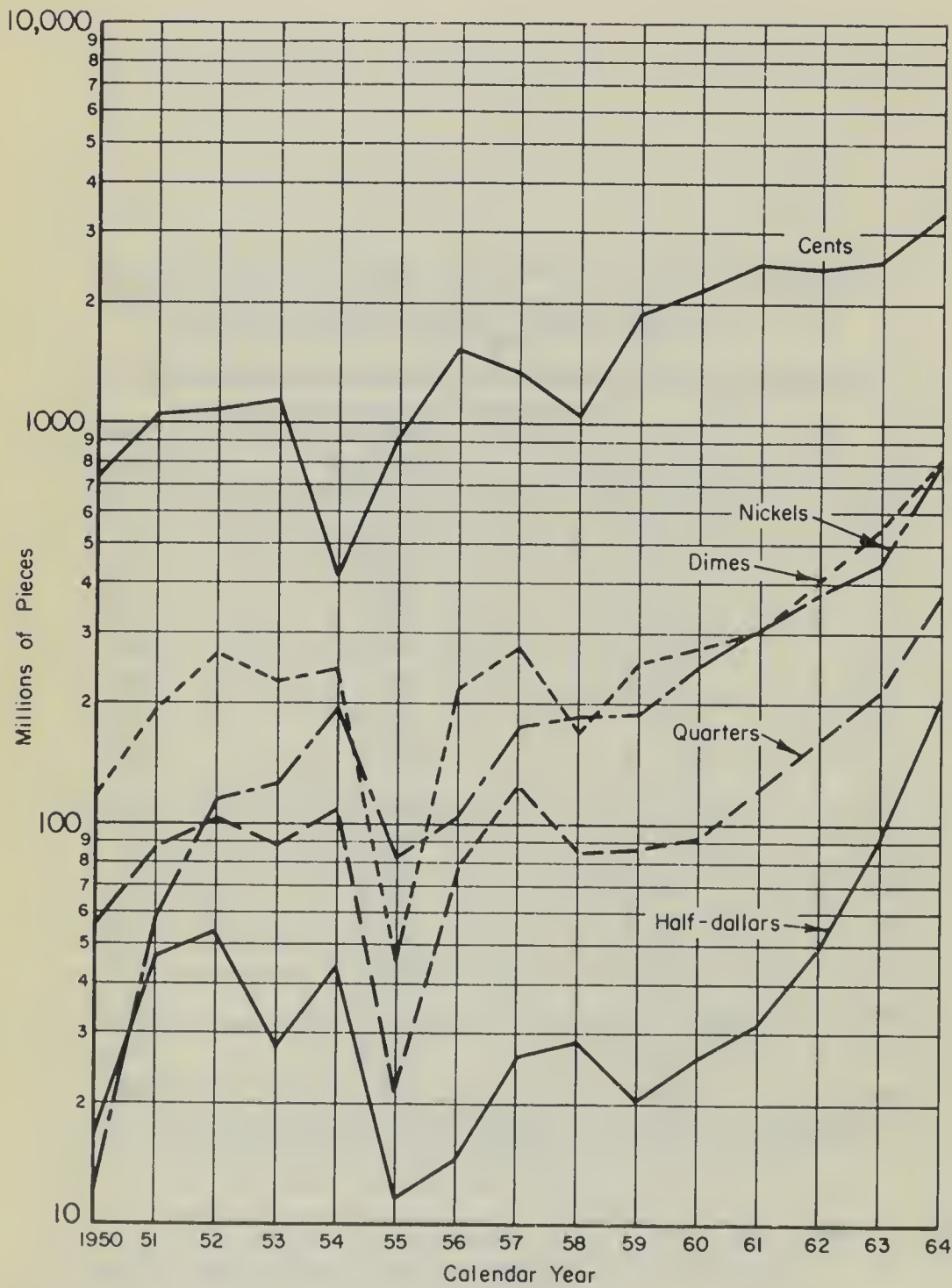


FIGURE B-4. ANNUAL COINAGE OF CENTS, NICKELS, DIMES, QUARTERS, AND HALVES IN THE UNITED STATES FOR THE CALENDAR YEARS 1950-1964



B-11

TABLE B-4. ANNUAL COINAGE OF CENTS, NICKELS, DIMES, QUARTERS, AND HALVES IN THE UNITED STATES, FOR THE CALENDAR YEARS 1950-1964

Year	Number of Pieces <sup>(a)</sup> , millions				
	Halves	Quarters	Dimes	Nickels	Cents
1950	16.3	56.3	117.4	12.5	726.1
1951	40.7	87.9	191.1	56.8	1,094.0
1952	54.2	102.4	265.6	115.3	1,070.8
1953	28.0	88.8	229.2	125.9	1,139.2
1954	44.0	108.8	243.5	194.4	419.6
1955	2.9	21.7	45.3	82.7	938.8
1956	4.7	77.1	217.3	103.1	1,519.6
1957	26.3	125.7	274.8	176.5	1,335.1
1958	28.9	85.4	169.4	186.2	1,054.4
1959	20.4	87.6	251.8	189.1	1,890.6
1960	25.9	93.9	272.2	249.7	2,169.0
1961	31.6	123.7	305.9	306.0	2,509.6
1962	48.5	166.9	410.6	380.8	2,402.4
1963	92.3	212.7	548.2	455.7	2,531.2
1964 <sup>(b)</sup>	203.0	383.0	813.0	799.0	3,339.0

(a) The number of pieces for each denomination can be converted to troy ounces of silver by multiplying the dollar value by 0.723.

(b) Estimated December 23, 1964.

B-12

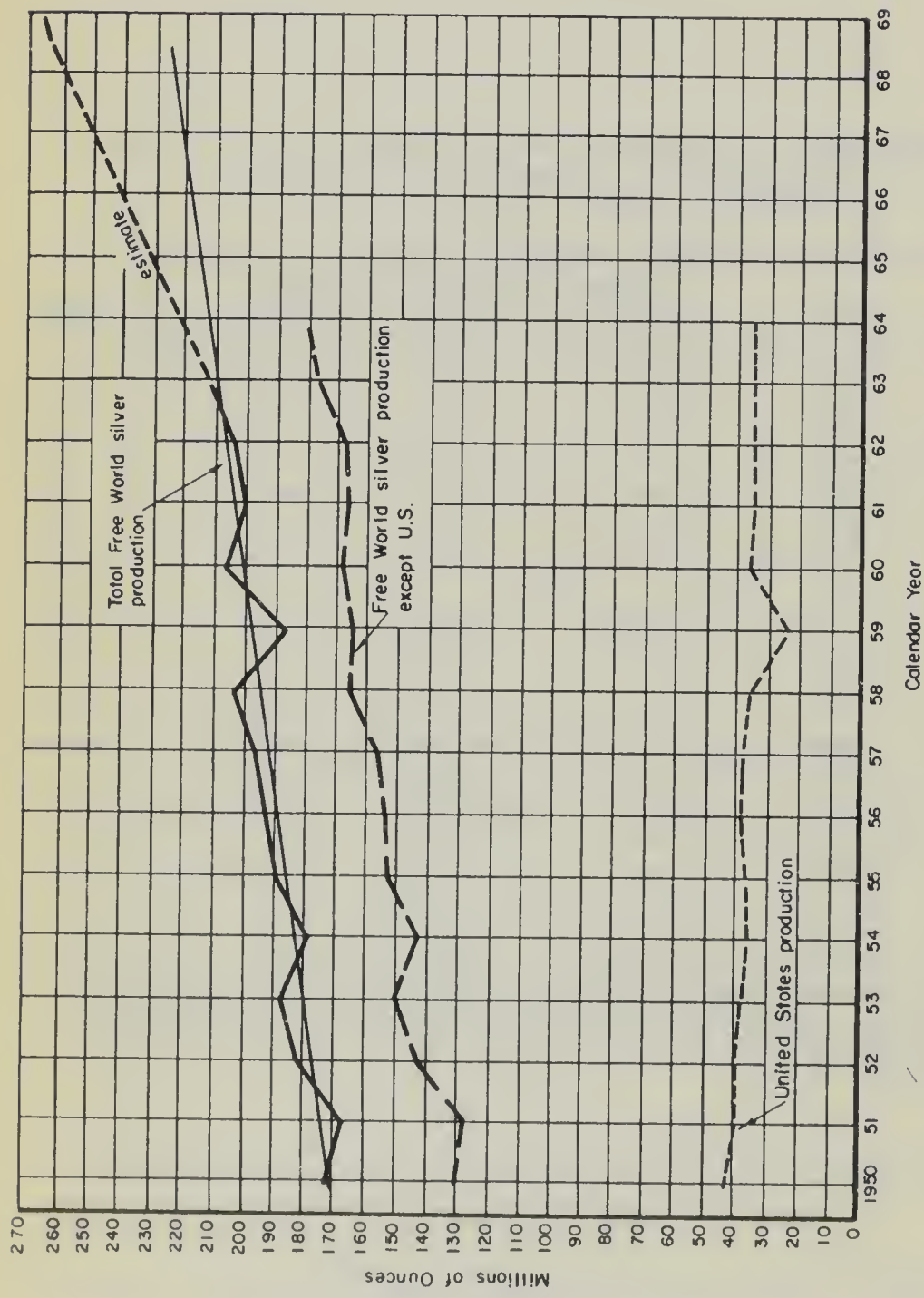


FIGURE B-5. PRIMARY SILVER PRODUCED IN THE UNITED STATES AND IN THE FREE WORLD DURING THE CALENDAR YEARS 1950-1963



B-13

TABLE B-5. PRIMARY SILVER PRODUCED IN THE UNITED STATES AND IN THE FREE WORLD DURING THE CALENDAR YEARS 1950-1963

Year	Production, millions of troy ounces	
	U. S. Production	Total Free World
1950	42.3	173.0
1951	39.9	167.7
1952	39.8	182.3
1953	37.7	187.7
1954	35.6	178.0
1955	36.5	189.0
1956	38.7	191.2
1957	38.7	195.4
1958	36.8	202.1
1959	23.0	186.8
1960	36.8	204.5
1961	34.9	199.9
1962	36.3	202.4
1963	35.0	210.0
1964	36.0	215

258 million ounces, from 210 million ounces in 1963. Beyond 1968 it is assumed that production increases will gradually assume past rates of change, with Free World production rising to 286 million ounces of silver by 1975.

#### Reserves of Silver

The Bureau of Mines estimates that in 1944 total world silver reserves were about 5 billion ounces of recoverable silver (about 170,000 tons). Of this, about 763 million ounces represents reserves of silver in the United States (about 26,000 tons). Since 1944 the depletion of these reserves has been offset, at least in part, by new discoveries of silver-bearing base-metal ores.

If the United States eliminated silver from coinage by the end of 1965, it is estimated that the cumulative demand for silver for all other Free World uses would be about 7.2 billion ounces (240,000 tons) by 1980. This demand is about equal to total world reserves of silver plus nonproductive sources including the U. S. Treasury stock of monetary silver.

Judging from developments since 1944, indications are that discoveries of new silver-bearing base-metal ores will suffice to meet the projected demands for silver

## B-14

for industry and other Free World coinage. However, should the United States retain a substantial proportion of silver in its coinage it appears that a much higher discovery rate of new silver will be necessary in the next decade than has been the case in the past 20-year period.\*

Stocks

In addition to production and unmined reserves, there are a number of world non-productive sources of silver. The sources include stocks held by the U. S. Government and foreign governments, including those of the Communist-bloc countries, silver as coinage in circulation or held in bank inventories, and industrial inventories including raw materials, scrap, and merchandise.

U. S. Monetary Silver. The most important of these stocks is the U. S. Treasury supply of monetary silver. As shown in Table B-6, this stock consists of silver bullion and silver dollars, which serve to back silver certificates in circulation and provide the raw material for manufacturing subsidiary coinage. Silver not needed for backing of silver certificates is termed "free silver" and is made available to the Mint for subsidiary coinage as needed or to private industry. Table B-6 shows that the stock of silver dollars, which was at a level of 242 million ounces in 1950, has been almost entirely depleted. Silver bullion backing silver certificates is estimated to be at a level of 1,190 million ounces at the end of the calendar year 1964. Inventories of subsidiary coin average less than 5 million ounces, reflecting a rapid movement from the Mints to the Federal Reserve Banks.

Table B-6 shows also that the total stock of monetary silver held in the Treasury rose from about 1,980 million ounces in 1950 to a peak of somewhat less than 2,110 million ounces in 1958. In each year since 1958, outflow has exceeded inflow, so that, by the end of the 1964 calendar year, the remaining silver stocks stood at a level of about 1,200 million ounces. Had it not been for Lend-Lease returns, outflow would have exceeded inflow during every year since 1951.

Silver in Circulation. In addition to monetary silver held in the Treasury, the United States monetary silver included 1,700 million ounces of silver in circulation as of December, 1963. An analysis of coin-loss rates, however, suggests that only 65 per cent of silver-containing subsidiary coins minted since 1920 remain in circulation.\*\* Assuming that silver dollars are no longer in circulation, this loss rate suggests that the total amount of silver in coins in circulation at the end of 1963 was 886 million ounces, or approximately one-half that shown in Table B-6.

Deposits and Withdrawals From U. S. Treasury Stocks. Table B-7 itemizes the deposits and withdrawals relative to the Treasury stock during the fiscal years 1950 to

\* In the short run, the shortage of silver relates more to production potential than to reserve potential.

\*\* Production Facilities for the United States Mint, Arthur D. Little, Inc., Feb. 11, 1963, in Hearing before a Subcommittee of the Committee on Banking and Currency, United States Senate, Eighty-Eighth Congress, first session on S. 874, U. S. Govt. Printing Office (1963)



B-15

TABLE B-6. UNITED STATES MONETARY SILVER HELD IN THE TREASURY FOR CALENDAR YEARS 1950-1964

Millions of Troy Ounces

	Calendar Year														
	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964 (est)
In Treasury															
Securing silver certificates															
Silver bullion	1,578.3	1,603.7	1,631.7	1,655.7	1,679.2	1,697.2	1,708.4	1,711.5	1,736.3	1,741.3	1,741.8	1,730.5	1,654.5	1,532.5	1,190
Silver dollars	241.9	232.8	223.8	215.2	207.0	196.1	182.8	169.4	156.8	141.1	124.9	100.7	72.7	22.1	2
Subsidiary coin	2.6	1.2	2.8	4.6	34.5	11.3	2.0	5.9	10.9	2.4	2.0	2.6	2.4	4.5	8
Free silver bullion	159.9	124.5	81.7	49.6	13.6	24.9	87.4	127.4	202.2	175.1	123.5	28.5	37.0	25.2	18
Total	1,982.7	1,962.2	1,940.0	1,925.1	1,934.3	1,929.5	1,980.6	2,014.2	2,106.2	2,059.9	1,992.2	1,862.3	1,766.6	1,584.3	1,218
Net change		20.5	(22.2)	14.9	9.2	(4.8)	51.1	33.6	92.0	(46.3)	(67.7)	(129.9)	(95.6)	(182.3)	(366)
Outside Treasury															
Coinage in circulation															
Silver dollars	139.1	148.0	156.6	164.9	172.5	182.0	195.1	208.3	220.8	236.2	252.3	276.4	303.6	352.9	373
Subsidiary coin	739.4	783.5	837.7	877.5	898.9	928.3	968.0	1,014.6	1,046.2	1,094.6	1,140.0	1,194.0	1,270.3	1,363.4	1,559
Total	878.5	931.5	994.3	1,042.4	1,071.4	1,110.3	1,163.1	1,222.9	1,267.0	1,330.8	1,392.5	1,470.4	1,573.9	1,716.3	1,932
Grand total	2,861.2	2,893.7	2,934.3	2,967.5	3,005.7	3,039.8	3,143.7	3,237.1	3,373.2	3,390.7	3,384.7	3,332.7	3,340.5	3,300.6	3,080

B-16

TABLE B-7. DEPOSITS AND WITHDRAWALS FROM MONETARY SILVER HELD IN THE U. S. TREASURY FOR FISCAL YEARS 1950-1964(a)

	Fiscal Year														
	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959	1960	1961	1962	1963	1964
Millions of Troy Ounces															
	Deposits (Receipts)														
Retired Subsidiary Coins	1.9	1.6	1.2	0.9	0.9	1.8	1.4	1.3	1.2	1.4	1.0	1.0	1.2	0.9	0.8
Lend-Lease Returns	--	--	--	--	--	11.2	49.4	95.4	119.3	75.0	14.6	3.3	15.6	0.1	--
Silver Bullion Ordinary	0.1	0.1	0.1	0.3	4.4	0.2	1.6	--	0.3	0.5	0.4	0.2	0.6	1.1	0.3
Purchases	41.2	38.1	38.8	35.6	33.7	34.7	15.5	6.6	26.2	20.4	0.7	0.3	0.1	--	--
Uncurrent Silver Dollars	0.2	0.3	0.3	0.3	0.4	0.5	1.4	0.3	0.2	0.2	0.2	0.1	0.3	0.6	0.8
Total	43.4	40.1	40.4	37.0	39.4	48.4	69.3	103.6	147.2	97.6	16.9	5.0	17.8	2.7	1.9
	Withdrawals (Issues)														
Coinage	10.8	30.9	56.3	56.1	60.4	16.8	17.2	48.1	49.4	36.5	41.0	42.3	75.2	83.6	144.0
Sold	0.2	1.8	0.1	0.1	0.1	0.2	10.5	7.7	0.1	11.5	30.8	40.7	38.9	2.3	56.4
Total	11.0	32.7	56.4	56.2	60.5	17.0	28.7	55.8	49.5	48.0	71.8	83.0	114.1	85.9	200.4
Net Change	32.4	7.4	(16.0)	(19.2)	(21.1)	31.4	40.6	47.8	97.7	49.5	(54.9)	(78.0)	(96.3)	(83.2)	(198.5)

(a) Silver Transactions of the Bureau of the Mint Fiscal Years 1934 Through 1964, Treasury Department, United States of America, U. S. Government Printing Office, 1964.



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1964.\* In the past 14 years, the principal sources of deposits have been:

- Worn coins retired from circulation
- Return of Lend-Lease silver
- Purchases of silver on the open market.

The second item, return of Lend-Lease silver, added substantially to the stocks between 1955 and 1962. However, little more silver can be expected from this source. In the 1964 fiscal year, total deposits into the Treasury stocks from all sources equalled only 2 million ounces.

Most of the withdrawals from stock have been for coinage. These withdrawals, as shown in Table B-7, ranged from 11 to 60 million ounces during the period from fiscal 1950 to fiscal 1961 and rose to 75 million ounces in fiscal 1962, 84 million in fiscal 1963, and 144 million in fiscal 1964. Silver-dollar withdrawals rose from 9 million ounces in fiscal 1950 to 50.6 million ounces in fiscal 1963. At present, 3 million ounces remain of the stock of silver dollars. Some silver has been sold to other Government agencies (1 to 6 million ounces per year), some of which is returnable.

Sales of Treasury silver to domestic purchasers or exchanges for silver certificates have also contributed to this deficit. Normally, these withdrawals could be expected to be between 25 and 65 million ounces of silver a year from the Treasury. However, since September, 1964, due to speculation, redemptions have ranged from 21 to 44 million ounces of silver per month, bringing the total for the calendar year 1964 to 141 million ounces. This redemption rate might be slowed in the future if the procedures for redemption were changed.\*\*

Other Free World Stocks. In 1963, important monetary stocks of silver held by Free World countries other than the United States amounted to about 105 million ounces. This was divided between bullion and coin as follows:

	<u>Millions of Ounces of Silver</u>
Silver bullion	78
Coin on hand	<u>27</u>
Total	105 <sup>(a)</sup>
(a) Source: U. S. Department of the Treasury (private communication).	
Total is for 24 countries.	

The largest stock of silver was held by Canada, followed by Japan and Switzerland.

Projected Changes in United States Monetary Stock of Silver

Although observers of the silver situation unanimously agree that the end of the U. S. monetary stock of silver is in sight, universal agreement regarding the life

\* The fiscal year 1950 began on July 1, 1949, and ended June 30, 1950.

\*\* At present, silver can be redeemed merely by presenting a check to the Treasury. The Federal Reserve Bank then sees that the necessary silver certificates are deposited with the Treasury.

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expectancy of this stock is lacking. Before proposing a solution to this situation, therefore, it is important to establish just how adequate this stock is to make up the deficit between projected Free World production and projected Free World requirements of silver. This forecast then serves as a foundation for evaluating alternatives for alleviating the projected scarcity of the metal.

For this forecast, U. S. production, consumption, and stocks of silver cannot be divorced from those of the other Free World countries. Because the factors of supply and demand that affect the life expectancy of these stocks are variable, it is also necessary to prepare a number of forecasts based upon varying assumptions of supply and demand. In this way the risk of an erroneous conclusion in the projected adequacy of silver stocks is minimized. Also, such a forecast directs attention to the controllable factors affecting these stocks, thus suggesting possible solutions to the silver problem.

### Assumptions

Table B-8\* is a projection of the life expectancy of the U. S. monetary stock of silver based on alternative levels in the silver content of U. S. coins. This forecast combines conditions of high productivity of silver with moderate increases in demand for the metal in industry and in the arts, together with decreasing Free World silver coinage in countries other than the United States.\*\* The uncertainty of projecting future United States coinage rates for this set of possible conditions is reduced by preparing projections for three situations: high, medium, and low rates of coinage demand.

The forecast is based upon the following assumptions:

- A. Free World silver production: increase of 48 million ounces per year by 1968 (4.3 per cent annual increase, 1963 to 1968, versus 1.5 per cent annual increase, 1950-1963) and 28 million additional ounces per year of production by 1975 (annual increase of 1.6 per cent from 1968 to 1975) for a total of 76 million ounces increase per year by 1975 (compared with an increase in production of only 40 million ounces per year in 1963 over 1950)
- B. Consumption in the arts and industry, total Free World: increasing at an average annual rate of 2 per cent during the period of 1963 through 1975 (compared with an average annual increase of about 4 per cent from 1950 to 1963)
- C. Free World coinage other than the United States: decreasing from 60 million ounces in 1963 to a level of 30 million ounces by 1970
- D. U. S. coinage demands - possibilities:
  - Situation I. High Coinage Rate - Demand for coins continues at full Mint capacity of 300 million ounces through 1975
  - Situation II. Medium Coinage Rate - Continuation of coinage demand at level of 1964 production of 208 million ounces

\* Table B-8 is given at the end of this Appendix.

\*\* This represents only one set of possible conditions and is not necessarily the most likely possibility.



## B-19

Situation III. Low Coinage Rate - Cyclic down-turn in coinage demand beginning in early 1965; demand drops from 208 million ounces in 1964 to 77 million ounces in 1966; demand increases from 1966 through 1975 at the projected rate of 5.1 per cent each year.\*

These situations are graphed in Figure B-6. In these projections it is assumed that the total Free World deficit, excluding U. S. coinage, will be drawn from the U. S. Treasury through silver certificate redemptions. This projected world deficit is comparable to average rates of redemption or sales of Treasury silver prior to 1964, and is therefore considered reasonable.

In these projections no attempt is made to include that portion of the world deficit that will be met from other nonproductive sources such as monetary stocks of other Free World governments, private hoards, and retired silver-containing coins. Also, transfer of silver to other Government agencies is excluded from the calculations. Although these deposits and withdrawals may affect year-to-year changes in redemptions of silver certificates, the total amount of silver involved is deemed insufficient to substantially change the outcome of these projections.

No provision is made in these projections for redemption of silver certificates for speculative reasons beyond 1964. Should redemptions continue at the above-average September-December, 1964, rate (due to speculation), the projected life of U. S. Treasury monetary silver would be substantially reduced. It is assumed, however, that the Treasury will continue to make its stocks available at or below \$1.38 per ounce in order to remove incentive for melt-down of present subsidiary coinage.

#### Estimated Life of U. S. Monetary Stock of Silver

The foregoing assumptions now serve as a framework for projecting the changes in the U. S. monetary stock of silver from 1963 through 1975 as a basis for evaluating alternative coinage possibilities. The alternatives considered in Table B-8 and summarized in Table B-9 for high, medium, and low coinage demand are

- (1) Continuation of the silver content in coinage at the present level of 90 per cent
- (2) Reduction of the silver content of coins to 50 per cent
- (3) Reduction of the silver content of coins to 30 per cent
- (4) Reduction of the silver content of coins to 15 per cent
- (5) Complete elimination of silver in U. S. coinage.

Alternatives 2, 3, 4, and 5 assume no change in the present coinage system prior to December 31, 1965.\*\* Also, no provision is made for the minting of silver dollars in any of the calculations.

\*A. D. Little projected long-run trend of demand for silver-containing subsidiary coins.

\*\*If a change could be made by June 31, 1965, the Treasury stocks would be extended by about 3 years if silver were entirely eliminated from coinage, under the assumptions listed above.

B-20

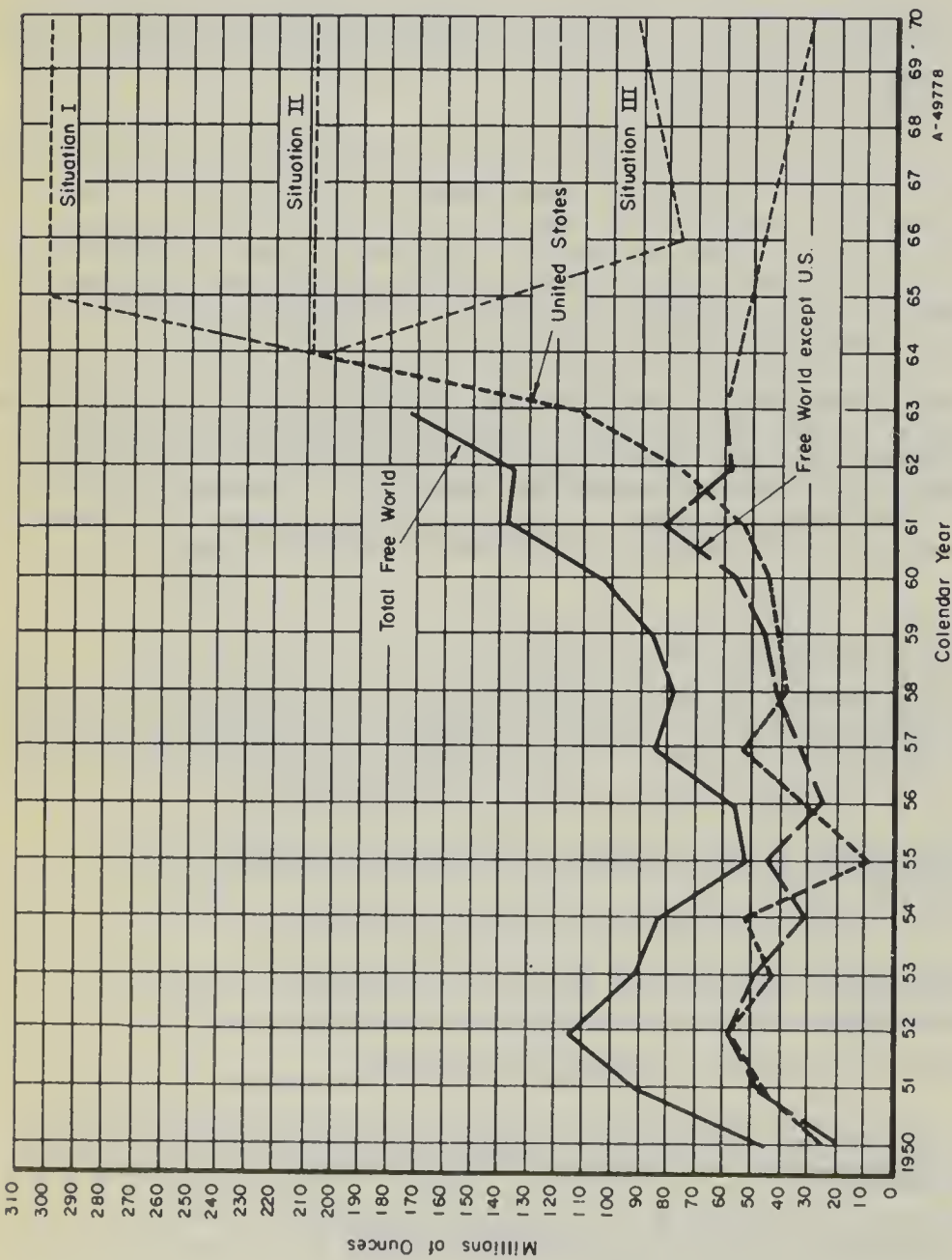


FIGURE B-6. QUANTITY OF SILVER USED IN COINAGE IN THE UNITED STATES AND IN THE FREE WORLD DURING THE CALENDAR YEARS 1950-1964 AND PROJECTED TO 1970



Table B-8 Projected Changes in United States Monetary Stock of Treasury Silver for Alternative Compositions of Subsidiary Coins (millions of ounces).

		1963	1964 <sup>(a)</sup>	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975
<u>Projected Free World Deficit of Silver Excluding U.S. Coinage<sup>(b)</sup></u>														
<u>Production</u>														
A	Total Free World <sup>(c)</sup>	210	220	229	239	248	258	269	270	275	279	282	285	286
<u>Consumption</u>														
B	Industry & Arts <sup>(d)</sup>	247	252	257	262	267	273	278	282	288	294	300	306	312
C	Coinage - other free world <sup>(e)</sup>	61	57	51	47	43	38	35	30	30	30	30	30	30
D	Total (B+C)	308	309	308	309	310	312	313	312	318	324	330	336	342
<u>Deficit</u>														
E	Total free world (A-D)	(98)	(89)	(79)	(70)	(62)	(54)	(44)	(42)	(43)	(45)	(48)	(51)	(56)
F	Speculative & distribution at silver dollars <sup>(f,g)</sup>		81	0	0	0	0	0	0	0	0	0	0	0
G	Redemption of Silver Certificates	98	150 <sup>(h)</sup>	79	70	62	54	48	42	43	45	48	51	56
<u>Projected Changes in U.S. Monetary Stock of Silver</u>														
<u>In Coinage Production at full mint capacity</u>														
<u>Consumption of Silver for alternative silver content of coins</u>														
H	90 Silver	111	208 <sup>(i)</sup>	290	390	500	590	600	600	600	600	600	600	600
I	50 Silver	111	208	290	167	167	167	167	167	167	167	167	167	167
J	30 Silver	111	208	290	100	100	100	100	100	100	100	100	100	100
K	15 Silver	111	208	290	50	50	50	50	50	50	50	50	50	50
<u>Silver withdrawn from U.S. Treasury to finance total world deficit</u>														
L	90 Silver (G+H)	209	358	369	370	362	354	346	342	343	335	344	351	356
M	50 Silver (G+I)	209	358	369	227	229	221	213	209	210	212	215	218	223
N	30 Silver (G+J)	209	358	369	170	162	154	135	142	143	145	148	151	156
O	15 Silver (G+K)	209	358	369	130	112	84	78	92	93	95	98	101	106
<u>Monetary Stock of Silver at end of calendar year</u>														
	90 Silver	1584	1220	757	497	125	(227)	(577)	(919)	(1242)	(1592)	(1949)	(2296)	(2652)
	50 Silver	1584	1220	857	620	391	170	(45)	(255)	(465)	(677)	(892)	(1110)	(1333)
	30 Silver	1584	1220	957	697	525	371	236	74	(49)	(194)	(342)	(493)	(649)
	15 Silver	1584	1220	857	737	625	541	443	351	258	163	65	(36)	(142)
	No Silver as of 11/1/66	1584	1220	857	787	725	671	623	581	538	495	445	394	348

(a) These data for 1964 are based on projections made early in December, 1964, and therefore differ slightly from other data used in the text. The discrepancies have a negligible effect, however.

(b) Parentheses indicate deficits.

(c) Assumes maximum production of silver to 1968 and slowing in production, 1969-1975.

(d) Assumes increase in consumption of 2 per cent per annum.

(e) Assumes reduction in other Free World coinage to level of 30 million ounces by 1970.

(f) In addition, about 20 million ounces of silver were sold as silver dollars.

(g) Actual silver used in coinage for 1964 was 201.3 million ounces.



Table B-8 (Continued)

		1	2	3	4	5	6	7	8	9	10	11	12	13
		1963	1964	1965	The Coinage Demand Steady at 1964 Level of Production									
		1966	1967	1968	1969	1970	1971	1972	1973	1974	1975			
1	United States Coinage of silver - 1964 level of production													
2	A	90 Silver	111	208	208	208	208	208	208	208	208	208	208	208
3	B	50 Silver	111	208	208	113	115	115	115	115	115	115	115	115
4	C	30 Silver	111	208	208	69	69	69	69	69	69	69	69	69
5	D	15 Silver	111	208	208	35	35	35	35	35	35	35	35	35
7	Redemption of Silver Certificates -													
8	E	Free World deficit	78	150	79	70	62	54	48	42	43	45	48	56
10	Total Silver Withdrawn from U.S. Treasury													
11	F	90 Silver (E+A)	189	358	287	278	270	262	256	250	251	245	256	264
12	G	50 Silver (E+B)	189	358	287	185	177	169	163	157	158	160	163	171
13	H	30 Silver (E+C)	189	358	287	139	131	123	117	111	112	114	117	125
14	I	15 Silver (E+D)	189	358	287	105	97	89	83	77	78	80	83	91
16	Monetary Stock of Silver Remaining in U.S. Treasury													
17	J	90 Silver (J-F)	1584	1226	939	661	391	129	(127)	(377)	(628)	(873)	(1129)	(1388)
18	K	50 Silver (K-G)	1584	1226	939	731	577	408	293	88	(70)	(230)	(393)	(559)
19	L	30 Silver (L-H)	1584	1226	939	800	669	590	499	318	206	92	(23)	(105)
20	M	15 Silver (M-I)	1584	1226	939	834	737	648	565	488	410	330	247	161
24	III. Cyclical Downturn in Coinage Demand													
1	United States coinage - cyclical downturn beginning in 1965													
2	A	90 Silver	111	208	140	27	81	108	119	93	98	102	108	113
3	B	50 Silver	111	208	140	93	45	46	99	52	59	67	60	62
4	C	30 Silver	111	208	140	26	27	28	30	31	33	33	35	37
5	D	15 Silver	111	208	140	13	13	14	15	15	16	17	18	19
7	Redemption of silver certificates													
8	E	Free World deficit	78	150	79	70	62	54	48	42	43	45	48	56
10	Total silver withdrawn from U.S. Treasury													
11	F	90 Silver (F+E)	189	358	219	147	143	138	137	135	141	147	156	164
12	G	50 Silver (G+F)	189	358	219	113	107	100	97	94	97	102	108	114
13	H	30 Silver (H+G)	189	358	219	76	89	82	78	73	76	78	83	88
14	I	15 Silver (I+H)	189	358	219	83	75	68	63	61	59	62	66	70
16	Monetary stock of silver remaining in U.S. Treasury													
17	J	90 Silver (J-F)	1384	1226	1007	940	717	579	492	307	166	17	(137)	(301)
18	K	50 Silver (K-G)	1384	1226	1007	894	787	687	590	396	397	297	189	75
19	L	30 Silver (L-H)	1384	1226	1007	911	823	740	642	517	513	435	352	269
20	M	15 Silver (M-I)	1384	1226	1007	924	844	776	713	646	587	525	459	389



TABLE B-10. PROJECTED CHANGES IN UNITED STATES MONETARY STOCK OF TREASURY SILVER UNDER CONDITIONS OF HIGH COINAGE DEMAND AND HIGH INDUSTRIAL DEMAND

(Millions of Ounces of Silver)

[illegible]





## B-25 and B-26

The projected life of the U. S. monetary stock of silver held in the Treasury according to the previous assumptions is summarized in Table B-9.

TABLE B-9. SUMMARY SHOWING YEAR IN WHICH U. S. MONETARY STOCK OF SILVER WOULD BE EXHAUSTED, DEPENDING ON THE SILVER CONTENT OF THE COINAGE AND THE DEMAND FOR COINS

Level of Coinage Demand	Alternative Silver Content of U. S. Coins, per cent				
	90	50	30	15	0
I. <u>High Level</u> - Coinage production at full Mint capacity of about 300 million ounces per year	1968	1969	1971	1974 <sup>(a)</sup>	1979 <sup>(a)</sup>
II. <u>Medium Level</u> - Continuation of 1964 coinage rate of about 200 million ounces per year	1969	1971	1973	1976	1980
III. <u>Low Level</u> - Cyclic down-turn in coinage demand beginning early in 1965	1973	1975	1977	1979	1983

(a) It should be noted that industrial demand for 1964 was at a very high level. If it should increase at the rate of 2 per cent per year from this level, the Treasury stocks could be exhausted in 1971 for the 15 per cent silver content alternative, and in 1974 if no silver were used in coinage. Details of this calculation are shown in Table B-10.

APPENDIX C

COIN-OPERATED DEVICES

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Physical Properties of the Present Silver Coinage Alloy . . . . .	C-5
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Alternative Solutions Relative to Coin-Operated Devices . . . . .	C-10
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## C-1

## APPENDIX C

COIN-OPERATED DEVICESKinds of Devices

Coin-operated devices dispensing a variety of goods and services have become commonplace in the United States. Two major categories of coin-operated devices are prevalent, namely, merchandise-vending machines and machines performing a service of some sort.

Merchandise-Vending Machines

The merchandise-vending machines, familiar to all, dispense such items as soft drinks, food, pocket combs, ice cubes, cigarettes, and small change for operating other such machines. This is a large industry. According to statistics presented by the National Automatic Merchandising Association, the sales from merchandise-vending machines alone will amount to about \$3.8 billion in the 1964 calendar year, compared with \$2 billion in 1957.

Coin Selection. Almost all of the 4 million merchandise-vending machines, except penny gum machines and the like, contain a device that detects various types of slugs and prevents all but a few of them from activating the dispensing mechanism. These devices are manufactured by three major companies, namely (in alphabetical order):

Coin Acceptors, Inc.  
National Rejectors, Inc.  
Reed Electromech, Inc.

All the devices operate on the same principles, which are discussed below. It is important to point out that these devices subject the coin to a series of tests designed to give an optimum degree of protection against slugs while accepting all or most of the genuine U. S. coins inserted in the machine.

Service-Vending Machines

Services dispensed by automatic machines include a number of well-established ones such as pay telephones and a number of newer ones such as automatic car-wash installations. Automatic washing machines and dryers, dry cleaning, juke boxes, and amusement devices (pin-ball machines) are additional examples of machines that perform services. Also included in this category are the self-serve collection baskets found on automobile toll roads and bridges.

## C-2

Coin Selection. Many of the machines that perform services do not contain the same highly sophisticated coin-selection devices as are used in the machines which dispense merchandise. Most of these machines (an estimated 800,000), however, have simple devices which will prevent magnetic materials and oversized slugs from entering the coin box.

The trend is toward increasingly more selective coin-discriminating devices in service-dispensing machines. The pay telephones operated by Bell Telephone Company\*, for example, have up to the present time accepted all disk-shaped pieces of metal that were not too large nor too small. Soon, however, Bell will install selectors capable of rejecting over 90 per cent of the slugs now accepted. An estimated 1,000,000 pay telephones will be altered.

Effect of Coinage Alloy on Coin-Operated Devices

From this brief description of the wide-spread use of coin-operated devices in the United States, it is evident that consideration must be given to the effect that any change in the coinage alloy will have on the industries involved.

Although the entire business of these industries is conducted with coins, a change to a coinage that cannot be accepted along with present coins will not prevent these industries from conducting their business. The principal consequence of such a change would be that the machines would not be as selective as they are now. This would mean a loss of revenue to the operators of "service" machines, and losses in goods by the merchandise vendors.

The magnitude of these potential losses cannot be estimated with any degree of accuracy at present.

Basis of Operation of Coin-Selecting Mechanisms

To a vending-machine operator, a slug is anything that can be used instead of a genuine U. S. coin in the operation of his machine. Thus, slugs may be brass washers, steel disks, play money, foreign coins, altered U. S. coins (such as a cut-down one-cent coin), or counterfeit U. S. coins.

Size. Several kinds of mechanisms are used to detect and reject slugs. The simplest of these is a sizing slot on the outside of the machines, preventing the insertion of slugs that are either thicker or larger in diameter than genuine coins. Cutouts in the coin rail inside the machine can be designed in such a way that undersized coins will fall through before reaching the actuating mechanism. Undersized coins are also checked in the weighing cradle (see below).

Magnetic Attraction. Another test which the coin must pass is that it not be attracted to a magnet. Any material that is attracted to a magnet is not a genuine U. S. coin since neither copper-zinc alloys (pennies), cupronickel (five-cent coin), nor silver-copper alloys (subsidiary coins) are magnetic.

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\*Total business volume in coins alone is \$450,000,000 annually.



## C-3

Weight. A coin that has been successfully inserted in the machine drops into a "cradle". The cradle performs a second test for correct diameter by catching the coin in a pair of curved arms if the diameter is correct; undersized coins drop through.

When the coin has lodged properly in the cradle, it comes to rest momentarily as the cradle, pivoted in an off-center position, is tipped by the weight of the coin. It is here that the coin is weighed. A small counterweight, carefully designed to permit rotation of the cradle by the relatively heavy silver-copper coins, will prevent rotation by coins made from light metals, such as aluminum. The coin is then cleared from the machine by various mechanical fingers.

Washer Catchers. At the instant the coin falls into the weighing and sizing cradle, a small wire probe pokes at the center of the coin. If the coin is a washer, the wire probe will enter the hole and prevent any further progress of the coin through the device.

Eddy-Current Response. Eddy-current action in a coin is a most critical test for genuine U. S. coinage.

A well-known principle of physics is that when an electrical conductor is moved through a magnetic field a current is generated in the conductor. In a disk-shaped conductor the current that is generated flows in small circular paths, which have come to be known as "eddy currents". The effect of these eddy currents is to create a second magnetic field which impedes the motion of the conductor through the primary magnetic field. The net result is that the disk is slowed down as it passes through the magnetic field.

The degree of retardation in the magnetic field will depend on the product of the density and the electrical resistivity\* of the coin. When the rate of retardation is measured, it is possible to separate the genuine U. S. silver alloys from cupronickels, brasses, bronzes, stainless steels, copper, zinc, and many other metals which might have passed the tests for size, weight, magnetic attraction, and absence of center holes.

#### Kinds of Coin-Selecting Mechanisms

Some, or all, of the above-described principles of operation of slug-rejecting mechanisms are put to work in various devices.

With very few exceptions, every coin-operated device will reject slugs that are attracted by a magnet. Often, those machines which perform services will depend on a sizing slot and a magnet as the only rejection devices.

Merchandise-vending machines almost always have a device that checks the coin for eddy-current response, in addition to the other characteristics: size, weight, magnetic attraction, and absence of a center hole.

The eddy-current type rejector, in its rudimentary form is shown in Figure C-1.

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\*Resistivity is the inverse of conductivity.

C-4

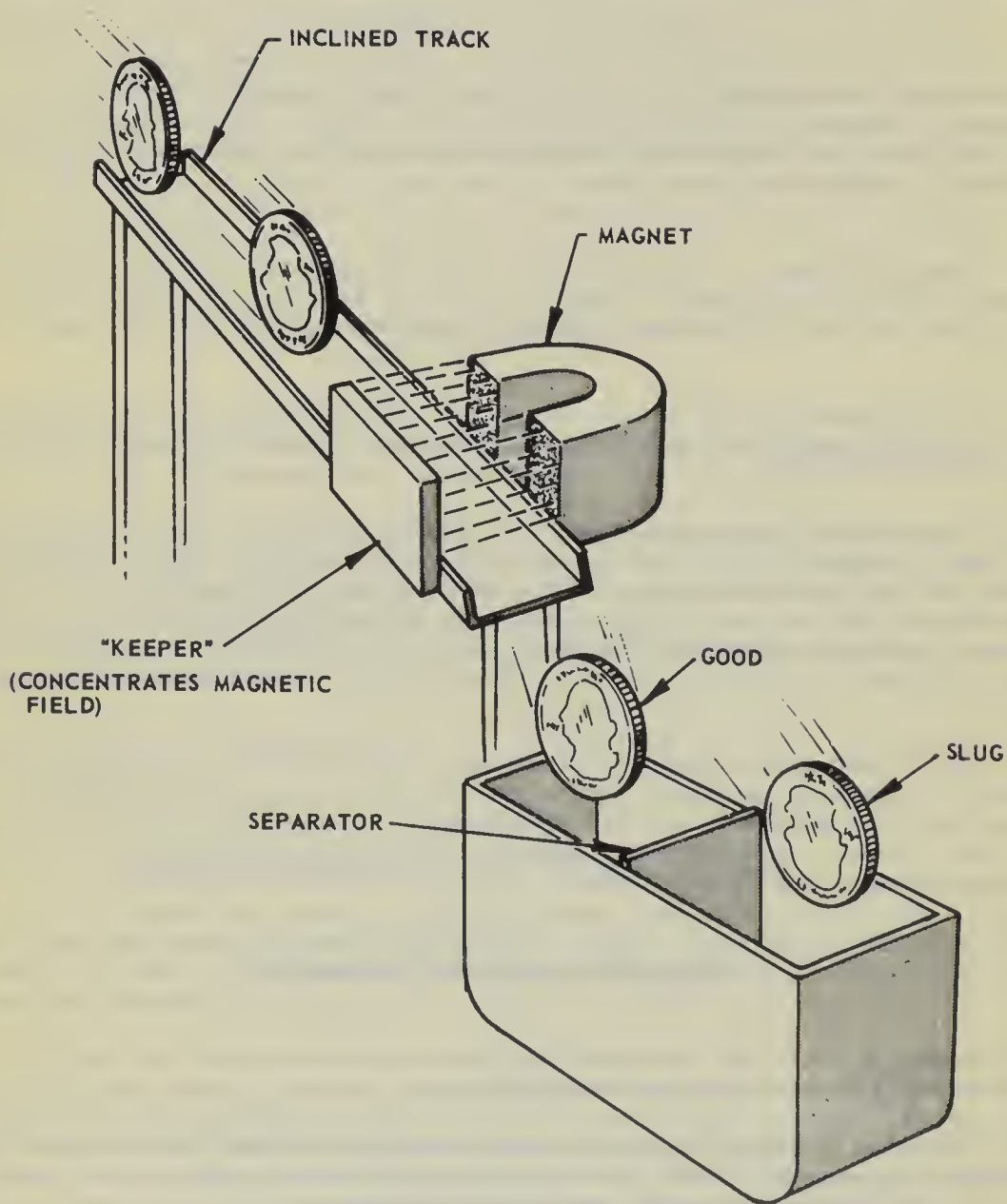


FIGURE C-1. EDDY-CURRENT TYPE OF SELECTOR (SCHEMATIC)



C-5

Physical Properties of the Present Silver Coinage Alloy

Since present coin-selecting devices aim to separate genuine U. S. coinage from slugs, it would be well at this point to review the physical properties of the 90 silver-10 copper alloy now used for subsidiary coinage and the relationship of these properties to coin-selector operation.

Thus, we find that the alloy has the following characteristics:

## (1) High density

Density = 10.3 grams/cubic centimeter  
 Weight of dime = 2.5 grams  
 Weight of quarter = 6.25 grams  
 Weight of half-dollar = 12.50 grams

## (2) Low electrical resistivity

Resistivity = approximately 2.1 microhm-cm

## (3) Low resistivity x density

Resistivity x density =  $2.1 \times 10.3 = 21.6 \frac{\text{microhm-g}}{\text{square centimeter}}$

## (4) Magnetic attraction

Nonmagnetic: will not be attracted to a magnet

Behavior of Candidate Materials in Present Coin-Selecting DevicesLightweight Metals and Alloys

Alloys of aluminum, magnesium, and titanium, known as the light metals, would not be compatible with present coinage in today's coin-selecting devices. They are too light to permit the cradle to revolve when the coin rests in it. Probably adjustments could be made in the cradle counterweight to permit use of lightweight coins. A more serious difficulty, however, arises in the actuating mechanisms tripped by the coins after they have left the selector. Most mechanisms require a weight of 2.1 to 2.2 grams to permit actuation. Present coin-silver dimes weigh about 2.5 grams; aluminum dimes would weigh only 0.66 gram. Even aluminum 25-cent pieces would be too light to trip the switches.

A further difficulty with lightweight coinage might be encountered by motorists attempting to toss their coins into a toll highway basket-type counter on a windy day. Much havoc could result.

In general, therefore, light coins would cause considerable inconvenience in the coin-operated mechanisms. Alloying of the light metals with very heavy metals, such as tantalum or tungsten, would be required to make them acceptable.

C-6

Magnetic Metals and Alloys

Magnetic materials, that is, materials attracted to a magnet, would be rejected by all eddy-current-type selectors, all "slide-type" units found on many of the service-performing machines, and all toll highway self-serve collection baskets.

Some of the common classes of materials that would be attracted by a magnet are:

- Nickel and many of its alloys
- Cobalt and many of its alloys
- Iron and many of its alloys.

Particularly important to note is that the 400-series stainless steels, which are principally iron-chromium alloys, are magnetic. Moreover, certain of the 300-series stainless steels, notably Types 301, 302, and 304, become slightly magnetic when coined, thereby making them unacceptable in many vending machines. On the other hand, very slight magnetic attraction might be used as a means of retarding the coin as it passes the magnets in the eddy-current section of the selector. This principle is the basis of a recent development by the International Nickel Company. Further discussion of this idea is presented below.

Metals and Alloys Having High Electrical Resistivity

Of the various candidate materials, almost all have higher electrical resistivity than coin silver. Because the product of electrical resistivity and density is so important to the coin-selector operation, it would be well to compare the candidate materials from this viewpoint. Table C-1 shows this comparison.

TABLE C-1. ELECTRICAL RESISTIVITY AND DENSITY OF SELECTED HIGH-RESISTIVITY MATERIALS

Name	Nominal Chemical Composition	Resistivity, microhm-cm	Density, g/cm <sup>3</sup>	Resistivity x Density, microhm-g/cm <sup>2</sup>
Aluminum Alloy 2024, age hardened	Al-4.5Cu-1.5Mg-0.6Mn	5.74	2.77	16
Aluminum Alloy X2020, age hardened	Al-4.5Cu-1Li-0.5Mn-0.2Cd	8.20	2.71	22
Gilding metal	Cu-5Zn	3.08	8.87	27
Commercial bronze	Cu-10Zn	3.92	8.81	35
Cartridge brass	Cu-30Zn	6.16	8.54	53
Columbium	Commercially pure Cb	14	8.60	120
Titanium	Commercially pure Ti	55	4.51	248
Nickel silver 65-18 (German silver)	Cu-18Ni-17Zn	29	8.73	253
Zirconium	Commercially pure Zr	40	6.48	259
75-25 Cupronickel	Cu-25Ni	32	8.95	286
Monel	Ni-32Cu	48	8.84	424
Type 301 stainless steel	Fe-17Cr-7Ni	72	8.05	580
Type 302 stainless steel	Fe-19Cr-10Ni	72	8.05	580
Nichrome V	Ni-20Cr	108	8.41	910



## C-7

The metals and alloys listed in Table C-1 have been arranged in ascending order of the resistivity x density product. Present selectors in vending machines can be adjusted to accept coin silver (resistivity x density = 21.6) and reject pure copper (resistivity x density = 15.4) on the low side and copper-5 zinc on the high side (resistivity x density = 27). In practice, the adjustment limits may vary somewhat.

The important conclusion that can be drawn from Table C-1 is:

Of the materials with electrical conductivity higher than that of coin silver, only two basic types are likely to pass the eddy-current test.

These two basic types are represented by aluminum alloy X2020 and the copper-5 zinc alloy. Any aluminum alloys with resistivities of about 8 to 8.5 microhm-cm would probably be acceptable, though there are few commercial alloys that would fit into this class. Various alloys could be compounded, however. The copper-5 zinc alloy is representative of the "modified coppers", which contain small amounts of such elements as phosphorus, cadmium, zinc, nickel, and manganese. In principle, then, the acceptable range of resistivity x density can be obtained by judicial alloying of either aluminum or copper to increase their resistivities, because both are lower in density than silver.

A further discussion of modified low-resistivity alloys follows.

#### Metals and Alloys Having Low Electrical Resistivity

Except for copper, aluminum, and gold, no metals approach the electrical resistivity of coin silver. Zinc, nickel, iron, columbium, and zirconium have many times higher resistivity than coin silver. Because of this, it is not possible to match the resistivity x density product of coin silver with any alloy except one based on metals lighter than silver. Even gold (if it were a candidate) would not be acceptable because of its very high density. Of the relatively light metals, only aluminum has a low enough resistivity to permit matching coin silver, with respect to eddy-current response.

As brought out in the previous section, the modified coppers may be suitable. Some of the commercial ones are shown below.

<u>Name</u>	<u>Chemical Composition</u>	<u>Resistivity, microhm-cm</u>
Deoxidized copper	Cu-0.02P	2.03
Zirconium copper	Cu-0.15Zr	1.99
Cadmium copper	Cu-0.9Cd	2.03

Examples of additions to copper, which would give alloys having resistivities of about 2.1 microhm-cm, are

<u>Element</u>	<u>Weight Per Cent</u>
Iron	0.04
Cobalt	0.06
Silicon	0.06
Arsenic	0.08

## C-8

<u>Element</u>	<u>Weight Per Cent</u>
Chromium	0.09
Manganese	0.13

A small amount of zinc (2-3%) or nickel (0.5%) might also be used to produce the effect desired.

Silver-Copper Alloys. The class of alloys represented by the present coin silver (90 silver-10 copper) can be made in any combination of silver and copper from 90 silver-10 copper to about 95 copper-5 silver and still have the resistivity of coin silver. Therefore, the eddy-current response among a broad range of silver-copper compositions would be acceptable.

It should be noted that various silver-copper alloys have been used in other countries. However, when the simple 50 copper-50 silver alloys have been adopted, it has been found that discoloration was a problem. Solutions to this problem have involved additional alloying with zinc or nickel, which not only improve the corrosion resistance but also obscure some of the pink or yellow coloration due to the copper. Below are several examples of copper-silver alloys that at one time or another have been adopted by foreign governments:

<u>Country</u>	<u>Alloy</u>
United Kingdom	50 silver
	40 copper
	5 zinc
	5 nickel
Sweden	40 silver
	50 copper
	5 zinc
	5 nickel
Mexico	10 silver
	70 copper
	10 nickel
	10 zinc

None of the above alloys have resistivities low enough to permit their use in the present-day coin selectors based on eddy-current response. Essentially, the increase in resistivity produced by the addition of nickel or zinc to the copper-silver combinations is the same as that produced when these additions are made to copper alone.

In sum, only the following classes of alloys would be satisfactory in their eddy-current response:

- High-resistivity aluminum alloys
- Modified coppers
- Silver-copper alloys.



C-9

Nonmetallic Materials

Plastics and ceramics both have very low density, which would preclude their use in present coin-operated devices. Moreover, they are electrical insulators and would show no response whatsoever in the eddy-current section of the coin selector. There is a possibility of making a composite consisting of low-resistivity metallic particles in a ceramic or plastic matrix, which might overcome some of these problems, but such developments would require a considerable amount of research to bring them to fruition.

Summary: Acceptable Materials

In the previous sections it was pointed out that:

- Lightweight metals - aluminum, magnesium, or titanium - would not be acceptable
- Magnetic metals or alloys would not be acceptable
- High-resistivity metal alloys would not be acceptable
- Ceramics and plastics would not be acceptable.

As a consequence of these restrictions, the only acceptable alloys are:

- Modified coppers
- Silver-copper alloys.

Further criteria of acceptance as coinage must be imposed on these two alternatives. Public acceptability is one criterion. Would a copper-colored coin be acceptable as a dime, quarter, or half-dollar? Because of the past association of copper-red alloys with coins of low denomination in many countries of the world, serious doubt must be voiced that such alloys would be acceptable as high-value U. S. coinage.

With the copper alloys, the incentive for illegal duplication is high. Moreover, an increase in slug making is possible because of the increased public knowledge that modified coppers will actuate coin-operated devices.

Silver-copper alloys present other difficulties, associated with the supply of silver. If the coin must be white-colored as well as corrosion resistant, it is extremely doubtful that any coin with less than 50 per cent silver can be a successful substitute for present coin silver. Substitution of a 50 silver-50 copper alloy for coin silver in all denominations of coins will not be possible on other than a temporary basis.\* Consideration must be given, therefore, to the possibility of substituting 50 silver-50 copper for only one of the denominations. If this were feasible, the problem of substitute alloys for the other two denominations still would remain.

Possible alternative solutions are discussed below.

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\*See discussion of Silver Supply and Demand.

## C-10

Alternative Solutions Relative to Coin-Operated DevicesAlternative 1. Modify Coin Selectors

Can the manufacturers of the various types of coin selectors modify them to accept other coinage? Undoubtedly, the answer would be yes if only new-coinage alloys were under consideration. Presently, for example, the eddy-current types of selectors can distinguish between genuine U. S. five-cent pieces and various types of slugs. In Japan, a pure nickel coin is distinguished on the basis of its unique magnetic characteristics. But the problem of designing a coin selector that would accept both the present U. S. silver coins and a new coinage is much more complex.

Two approaches are possible. Either a simple modification would be made by a service man or a complete new design worked out. Both of these approaches have pitfalls. Thus, simple adjustments, as presently comprehended, could indeed be made to accept both present coinage and cupronickel; but, if this were done, the device would lose some of its selectivity and would also accept brasses, zinc, nickel silvers, and possibly other less common alloys. Estimating the financial losses caused by this lack of sensitivity is beyond the scope of this study, but it is clear that some loss would occur.

The second approach, that of making a completely new coin selector or making a modification that required return of the device to the factory, would be a costly approach. Estimates for such modifications range from \$5 to \$60 each, for several million machines. However, the possible disturbance to the industry caused by the changeover would perhaps be more serious than the direct cost. Immediate changeover is not possible. Industry estimates of the time for complete changeover have ranged from 2 to 10 years.

Alternative 2. Composite Coins

An engineering materials problem that cannot be solved by using a single metal or alloy is often approached by combining two or more metals in such a way that each component of the combination performs a different function, while the composite meets the over-all requirements. An everyday example is copper-bottomed stainless steel pots and pans for cooking. Stainless steel, very resistant to corrosion by food and detergents, is not a good conductor of heat. Therefore, in stainless steel cookware, hot spots might develop and scorch the food. Copper, a good conductor, is applied to the bottom, which causes the heat to spread evenly and prevents scorching.

This principle can be applied to the coinage problem. We are confronted with the problem that the only alloys with low resistivity (besides the silver-copper alloys) are either too light or are red colored. The solution is then to make the light alloys heavy by combining them with a heavy metal, or to make the red alloys white by covering them with a white metal or alloy.

The possibilities of combining aluminum alloys with heavy elements are very limited because such heavy elements as tantalum or tungsten are not in abundant supply in North America. Another heavy element, spent uranium, is ruled out because of the emotional effects it might have on the public. Accordingly, composites involving aluminum are ruled out.



## C-11

Various ways of making copper appear white are known. It can be plated with nickel, silver, or a number of alloys. Silver-plated copper alloys could be made to look like present coinage and act like present coinage in the vending machines.

Another way of making a white-looking copper alloy is to make a multilayer sheet from which blanks would be cut for coining. The multilayer would consist of a white metal covering on both sides of copper or a copper alloy. In principle, the copper, having low resistivity, would provide the eddy-current response, while the outer layer would provide the white appearance. Actually, the eddy-current response depends on the particular combination of metals and their relative proportions. A cupronickel (75 copper-25 nickel) clad on copper in the proportions shown in Figure C-2 has been found to behave satisfactorily in the eddy-current type of coin selectors.

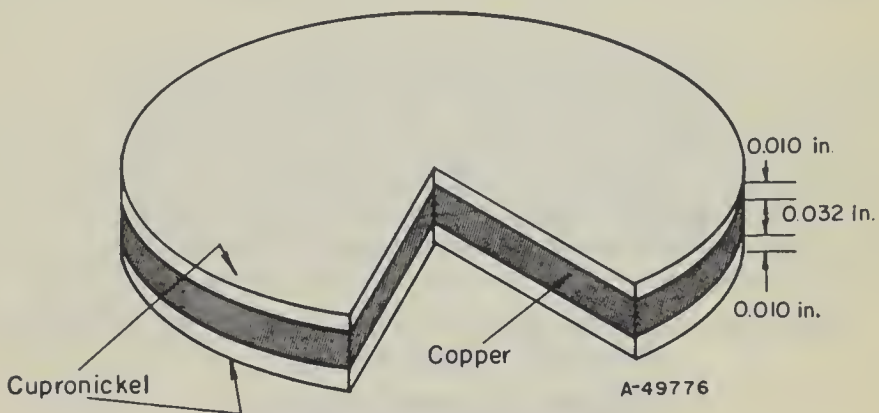


FIGURE C-2. MULTILAYER BLANK, 25-CENT SIZE

A variety of multilayer combinations are possible. For example, instead of cupronickel on copper, the following combinations might be possible.

<u>Outer Layers</u>	<u>Core</u>
90 Silver-10 copper	98 Copper-2 zinc
75 Copper-25 nickel	Various silver-copper alloys
70 Copper-30 silver	75 Copper-25 nickel

The first composite would behave the same as the present coinage, regardless of the proportions of clad and core. The last two would conserve silver but would have a white exposed outer edge rather than red, as shown in Figure C-2, which would be the case if the core were copper.

The disadvantages associated with this approach are: (1) a complete investigation of the manufacturing variables has not been made and (2) the Mint is not now equipped to manufacture such a material, so industrial sources must be acquired.

## C-12

A third approach, based on the philosophy of composites, is a powder-metallurgical one. It might be possible to make a mixture of powders of silver or copper in a white-metal matrix such as cupronickel. If special procedures were followed, or a careful choice of matrix materials made, the result would be a composite consisting of a dispersion of low-resistivity metal in a white matrix. Figure C-3 is a schematic diagram of a powder-metallurgical composite.

The feasibility of this approach has recently been demonstrated by the Kawecki Chemical Company, using a columbium matrix. Several months of development work would be needed to establish manufacturing parameters. Mint production of coin blanks by compacting and sintering would be a vast departure from present processes, but these processes could be incorporated in the new Mint. In the interim period, the Mint would have to purchase blanks from industrial suppliers, though the lead time required for the production rates needed will be on the order of 6 to 18 months. A complete cost or technical evaluation of this approach has not been made at this time, but indications are that the cost of the blended powder would be about \$15 per pound, and blanks perhaps \$20 per pound.

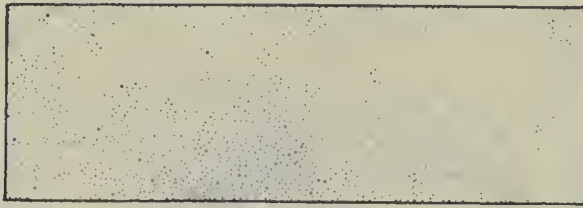


FIGURE C-3. CROSS SECTION OF POWDER-METALLURGICAL COMPOSITE (SCHEMATIC)

Dark spots represent copper or silver particles.  
Matrix is a white metal or alloy.

#### Alternative 3. Slightly Magnetic Materials

A third alternative has been proposed by the International Nickel Company. The basis of this proposal is the following:

When a slightly magnetic coin rolls past the magnet in the eddy-current section of a coin selector, the coin is attracted to the magnet. As the face of the coin rubs along the magnet, the resulting frictional drag slows up the coin just as if it had been retarded by the eddy-current mechanism.

Proper behavior of a coin using this principle requires a very carefully controlled degree of magnetism. This has been achieved by making a composite consisting of a nonmagnetic material (95 nickel-5 silicon) that has been clad to a Permalloy core (80 nickel-16 iron-4 molybdenum). The magnetism of Permalloy can be controlled very closely. Only 1.5 per cent of the thickness of the 25-cent coin contains the



## C-13

Permalloy, which is sufficient to produce the effect desired. The International Nickel Company has proposed that a piece of special tape be applied to the magnet poles of the various models of coin selectors. By so doing, the frictional drag can be made equivalent to the eddy-current retardation.

Because this method depends on friction, the rims of the coins would have to be redesigned to give a uniform rubbing surface. Otherwise, wear would progressively alter the action of the coin in a coin selector.

This composite was developed as a temporary coinage material that would be acceptable in coin-operated devices along with present coins. After the operators of coin-operated devices have had a chance to adapt their devices to accept coins with either high or low resistivity, the magnetic core could be eliminated. The nickel-5 silicon alloy would then be acceptable to all coin-operated devices.

An advantage of this proposal is that the composite is an all-white combination with a good appearance. The core makes up only 1.5 per cent of the cross-sectional area, and could therefore, be abolished (at the appropriate time) without any change in appearance.

At the present state of development, this approach has not worked completely satisfactorily in all coin-operated devices. Because the principle of operation is based on frictional drag rather than eddy-current retardation, more problems can be expected from this composite than from the multilayers, whose operation is based on eddy-current drag. Problems with wear of the coin, magnetic field variation, and alteration of the present devices, which would be minimal with the multilayers such as cupronickel on copper, would be troublesome to the nickel-5 silicon-magnetic core composite. Moreover, the Mint would be required to purchase the composite, since it is not now equipped to make it.

#### Evaluation of Proposed Solutions

If the coin-operated machine industry is given consideration, and if it is agreed that red alloys would not be well received by the public, then two of the above proposals seem to merit the most consideration:

- (1) 50 Silver-50 copper alloy
- (2) Multilayer materials consisting of either cupronickel on copper, or various other combinations of silver-copper alloys, copper, modified coppers, and cupronickel.

In the case of the 50 silver-50 copper alloy, some difficulties can be expected in Mint processing. Basically, however, the manufacture of this alloy should be within the present capabilities if minor changes in equipment are made.

The multilayer materials described are preferable to the composite involving a magnetic core. It would seem that if a composite is to be made at all, it should be based on the eddy-current principle rather than others. On the other hand, if the visible red edge is intolerable in the first case and combinations of white alloys are not feasible

C-14

for various technical reasons, the slightly magnetic nickel-base alloy composite should be given further consideration.

The principle problems yet to be fully established relative to the other multilayer composites are:

- (1) Sources of supply of multilayer materials
- (2) Manufacturing tolerances by suppliers
- (3) Quality control in the Mint
- (4) Effects of wear.

Some effort has been devoted to these problems, but more work should be done before a change-over to multilayer materials is undertaken.

One solution which would use a limited amount of silver is to clad copper with the Swedish alloy (50 copper-40 silver-5 nickel-5 zinc). This silver alloy would be preferred to the 50 silver-50 copper alloy because of somewhat improved tarnish resistance.

Before deciding on copper as the core composition, another factor to consider is that the annealing temperature of this metal is much lower than that of the clad. These temperatures should be as close together as possible. The addition of 25 to 30 troy ounces of silver per ton of copper, or 0.1 per cent zirconium, will raise the hot working and annealing temperatures by several hundred degrees Fahrenheit. An addition of about 1 per cent zinc will raise the resistivity slightly, thereby improving the discrimination of the coin selector.

Accordingly, the following specification is offered tentatively, as the material for all denominations of subsidiary coin:

(1) Chemical Composition

Outside layers: 40 per cent silver  
50 per cent copper  
5 per cent nickel  
5 per cent zinc

Core: silver-bearing copper (25-30 oz/ton), containing 1 per cent zinc

(2) Layer Thicknesses in the Strip Used for Blanking (40 per cent outerlayers, 60 per cent core)

Coin Denomination	Nominal Over-All Strip Thickness, inch	Nominal Thickness of Outside Layers, inch	Nominal Thickness of Core, inch
Half-dollar	0.067	0.0134	0.0402
Quarter	0.052	0.0104	0.0312
Dime	0.039	0.0078	0.0234



## C-15 and C-16

The outside layers comprise 41.3 per cent by weight of the over-all composite; the over-all silver content is 16.5 per cent by weight.

This combination could be changed to cupronickel on copper at any time, without changing the thicknesses. If the 1 per cent zinc is not included in the core material, no change in behavior in coin selectors will occur.

APPENDIX D

MINT OPERATIONS

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## D-1

## APPENDIX D

MINT OPERATIONSDescription of Mint OperationsIntroduction

An important criterion which must be used in rating a possible alternative material for the current coinage alloys is the ability of the Mints to make coins from the material.

Congress has recently authorized a new Mint, to be located in the city of Philadelphia. The new facility will incorporate modern melting, rolling, annealing, and coining machinery capable of handling a number of the alternative materials that may be selected for new coinage. However, the new Mint is not expected to go into production for several years. As a result, the present Mint facilities must handle the production of coins from the new material until the new Mint is ready.

The Mint has for years been an integrated operation with essentially complete control of all aspects of coinage from the melting of the alloys to the coining operation, including final inspection, counting, and bagging of the finished coins. For most of its history, the Mint has used only three alloys in making coins for the United States. These alloys are processed through the Mint as shown in Figure D-1. Each of the important steps will be considered separately. All the steps described were observed at the Philadelphia branch of the Mint, but the Denver branch has essentially the same setup.

Melting and Casting

In the Mint melt shop, the required amounts of metal for the alloys used are weighed out and charged cold into 750- pound-capacity high-frequency induction furnace units. Each unit has an available power supply of 200 kw. Clay graphite furnace linings are generally preferred, particularly for the current silver alloy. During recent operation, the melting and casting facilities have been devoted exclusively to the 90 silver-10 copper alloy. There is not enough capacity to handle the melting of all three coinage alloys at this time. The result is that coiled alloy strip, required for one-cent and five-cent pieces, is currently being purchased from outside vendors.

Molten silver coinage metal is cast into rectangular slabs in water-cooled, copper-faced "book" molds, yielding an ingot 1-1/2 inches by 9-3/8 inches\* x 5 feet long weighing about 315 pounds. This slab ingot requires no surface preparation, other than wire brushing, and goes directly to the rolling mills for a cold reduction pass.

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\*12-inch-wide slabs are made at the Denver Mint.

D-2

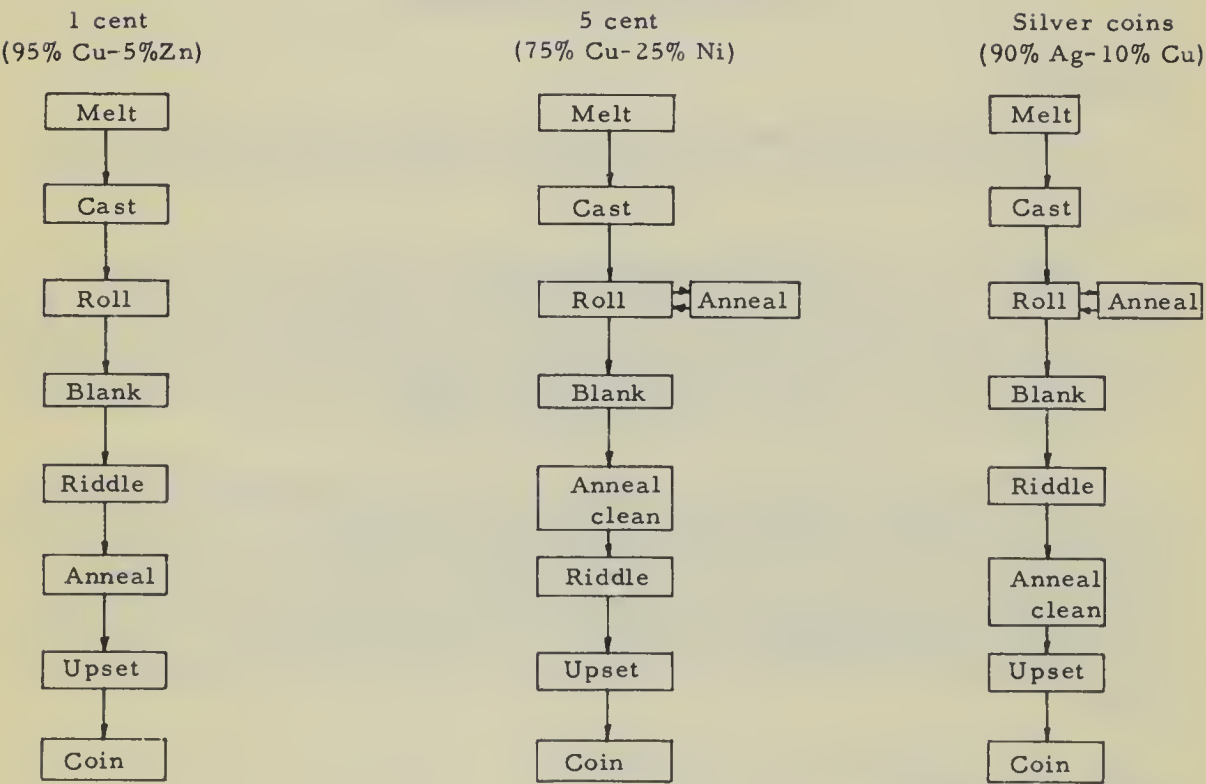


FIGURE D-1. BASIC MINT COIN PROCESSING



## D-3

The introduction of alternative metals and alloys such as nickel, nickel-chromium, or stainless steels would require a change in melting practice and different furnace linings. It could also mean an alternation of the casting technique and equipment to safely and efficiently handle the higher-melting-point materials. A much more drastic change would be necessary were the Mint required to melt and cast the so-called refractory or reactive metals such as titanium, zirconium, or columbium. Consumable-electrode vacuum-arc type melting equipment is required. Contamination by gases such as oxygen and nitrogen must be kept at a minimum because such contamination, even in small amounts, sharply increases the hardness and decreases the workability of these metals.

Of the metals and alloys already suggested as possible alternatives for 90 silver-10 copper, the cupronickel, nickel silver, and various silver-copper alloy modifications are the only white alloys that could be handled in the present melting equipment. Most copper-base alloys could also be handled. The melting and casting of the present silver alloys at the Mint has reached a high degree of perfection and efficiency, and the product is consistently of the highest quality as is evidenced by the excellent coins that are made from the ingots.

Rolling

The Mint is presently capable of cold rolling such alloys as cupronickel, 90 silver-10 copper, and most copper-base alloys. No provisions have been made for heating ingots or slabs to hot roll them. A furnace for annealing between cold reduction passes is available. For example, the current high-silver alloy is rolled to size with two intermediate anneals with about a 50 per cent cold reduction of the cast slab before the first anneal. The cold rolling to final size prepares the strip for blanking, which could not be carried out in a satisfactory manner if the strip were annealed.

All the present coinage alloys are handled by cold rolling and annealing with no difficulty. However, alternative alloys, such as the stainless steels, the high-nickel alloys including nickel-5 silicon, titanium, and zirconium would require rolling techniques and equipment not now available at the Mint. Special annealing equipment would also be required and, in the case of metals such as titanium, columbium, and zirconium, protection from gaseous contamination would be required during annealing. Columbium, on the other hand, does not work harden rapidly during cold rolling and it could perhaps be reduced without intermediate annealing. However, it is probable that at least one annealing treatment would be required before coining, regardless of what metal or alloy were chosen.

In connection with rolling operations, a smooth, clean surface is required to produce high-quality coins. With the present alloys, a good surface is maintained without any special descaling or pickling steps. Some of the alternative metals and alloys might pose a problem in this respect unless the Mints bought the material from outside vendors rolled to the final finish and size desired. It is doubtful, that the Mint's rather old rolling equipment could properly handle most of the alloys which have been suggested as possible alternatives to the current silver alloy.

## D-4

Blanking

After the coin metal is rolled to the proper thickness, it is sent through the coin blanking machines, which punch out the coin blanks or planchets. With the present alloys, this is done with the strip in the cold-rolled condition, as this results in the blank having a clean and sharp sheared edge. If annealed before blanking, the punch drags the metal and leaves an unsatisfactory burred edge. Although the blanking step presents no particular problems, some of the possible alternative metals may be more difficult to punch, with the result that die life would be shortened.

The blanking operation produces about 30 per cent scrap, the inevitable result of punching circular blanks from strip stock. With the present coinage alloys, the blanking scrap presents no problems. Scrap from each of the alloys is (or can be) readily reverted into the melting cycle. However, with certain alternative materials such as a composite made by cladding cupronickel to a 50 silver-50 copper core, the blanking scrap could not be simply remelted. In a case of this type, it would be necessary to process the scrap in such a way as to separate the silver, copper, and nickel. The separation of these metals, however, is not difficult. The monetary value of the scrap would be based on the value of the metals recovered minus refining and handling charges. On the other hand, scrap from a composite of cupronickel clad on copper could be reverted directly for production of the present 5-cent coin or for production of the cladding of the cupronickel-copper composite. If the Mint were purchasing such alternative metals as titanium, zirconium, or columbium in strip form, the blanking scrap would have to be carefully segregated and returned to the outside supplier for remelting and reprocessing. The reprocessing costs would be relatively high for these metals, perhaps as much as 75 per cent of the original cost of the rolled product.

Upsetting

In the upsetting operation, the coin blanks or planchets are passed between rolls to raise or upset the rim of the blank. The rim thickness is greater than that of any other part of the coin, providing some protection against wear of the central portions of the coin. Also, as long as the rim is thus raised the coins will "stack" properly.

Coining

The coining process is a critically important part of the total Mint operation; it provides a very real test of any material suggested for use in coinage. During the coining operation, the coin blank is pressed simultaneously between obverse and reverse dies to form the complete design, including the milled edge ("reeding") when the latter is required. For 1-cent, 5-cent, and 10-cent coins, the press capacity is large enough to handle a pair of dies, so that one stroke of the press produces two coins. Coinage presses operate at about 140 strokes a minute, so that each press can produce about 280 pennies, nickels, or dimes per minute. The quarter dollar and half-dollar, being larger in area, require more pressure for coining and only one coin is produced for each stroke of the press.

Generally speaking, the coining presses are quite old and limited in capacity. According to Mint personnel, the design load limit of these presses is 150 tons. Currently, the presses are operating at, or slightly in excess of, their rated load.



## D-5

The introduction of new coinage alloys of higher strength and hardness than the present alloys could impose a severe strain on the presses, even for the small-size coins. This might mean that only single-coin dies could be used instead of dual ones, with a resultant lowering of production rate. Larger coins such as the half-dollar may be very difficult or even impossible to coin from high-strength material on the present equipment. For example, difficulty was experienced when the Mint made coins for Costa Rica from a 17 per cent chromium stainless steel, in spite of the fact that the design or embossing was relatively shallow as compared with that on United States coins.

The coining die, as distinct from the press, can withstand only a limited pressure. Excessive wear and possibly cracking would be the result of using harder or more abrasive materials that require high coining pressures. This would cause more down time, not only as the result of higher stresses imposed on the old presses, but also because of the need to replace dies more frequently.

Results of Coin Striking Trials

A number of the possible candidate materials were selected and taken to the Philadelphia Mint in the form of rolled strip to determine how well they could be blanked, upset, and coined. Table D-1 lists the materials and observations on the results. The rolled strip material, in the proper thickness for the particular coins desired, was first blanked and upset as in normal Mint practice. For the actual coining step, special dies were prepared by the Mint designers and engravers, which would duplicate as nearly as possible both the obverse and reverse design features of a typical dime, quarter, and half-dollar. Coining was done on a hydraulic press instead of on a mechanically actuated production coin press. The strain rate in the hydraulic press is much lower than that in the "knuckle" presses normally used for coining, which might influence the plastic behavior of the metal as it is pressed between the coining dies.

The materials chosen for the Mint tests were representative of the classes of materials listed in Table 3 in the main body of this report. Some of the metals, such as pure nickel, aluminum, copper and copper alloys, were known to be readily coinable. Cupronickel, for example, was familiar to the Mint as the alloy used in the five-cent coin, but it has not been used in the larger sizes such as the quarter, dollar, and half-dollar sizes. The various silver-copper alloys and their modifications represented dilute silver alloys that are white and compatible with present vending-machine requirements. Columbium and zirconium represented exotic metals which under certain qualified conditions, were considered as possible candidate materials. The nickel-base alloys were represented by Monel and a special nickel-5 per cent silicon alloy containing a Permalloy core. Austenitic stainless steels were represented by Types 301 and 302.

The data in Table D-1 show that there was no difficulty in blanking any of the materials. However, coin blanks of some of the materials did not upset properly during the edge-rolling operation. For example, two of the composite materials, the silver-clad copper and the cupronickel-clad copper tended to buckle during the edge-rolling operation. The problem was more pronounced with the quarter-dollar-size blanks than with the 10 cent size blanks. Photomicrographs, Figures D-2 and D-3, show that the bond between the outside layers and the copper successfully withstood the blanking and upsetting operations. The cause of buckling may have been

D-6

TABLE D-1. COINAGE TESTS OF CANDIDATE METALS AND ALLOYS

Material	Coin Sizes	Blanking	Upsetting	Coining Operation(a)	Remarks
50 Silver-50 copper <sup>(b)</sup>	10¢, 25¢, 50¢	Satisfactory	Satisfactory	Satisfactory, all sizes	
75 Copper-25 nickel (cupronickel)	10¢, 25¢, 50¢	Satisfactory	Satisfactory	Lettering next to rolled edges not filled out in some places; otherwise very good	10 cent size very good
Cupronickel-clad copper	10¢, 25¢	Satisfactory	Some difficulty <sup>(c)</sup>	Some blanks bent; coins generally good; very good 10-cent size	Blanks tended to buckle during upsetting operation
90 Silver-10 copper clad on copper	10¢, 25¢	Satisfactory	Some difficulty	Imperfect rim area, probably improper edge rolling; otherwise generally good	Blanks tended to buckle during upsetting operation on 25-cent size; 10-cent size coined very well
Columbium	10¢, 25¢	Satisfactory	Satisfactory (unannealed)	Appearance of coin good; design & lettering sharp; 10¢ coined very well	Coin dark gray, but not unpleasant appearance; blanks did not dish when upset
Zirconium	25¢	Satisfactory	Difficulties	Design not quite filled out next to rim	Blanks dished during edge-rolling operation; coins also dished with obverse design above rim
Monel (commercial)	10¢, 25¢	Satisfactory	Poor 25¢ size Fair 10¢ size	Design not filled out next to rim; coin convex on obverse side above rim	25-cent blanks dished badly during edge rolling; 10-cent size fair, but some dishng
Austenitic stainless steel, Type 301	10¢, 25¢, 50¢	Satisfactory	Poor	Unsatisfactory; design did not come up, particularly adjacent to the rim	Upset blanks were dished; coins were concave on reverse side, with obverse convex above rim
Austenitic stainless steel, Type 302	25¢	Satisfactory	Poor	Same as Type 301 stainless steel	Blanks dished severely during edge rolling; coin concave on reverse side, with obverse convex above rim
Nickel-5 silicon-Permalloy (Inco)	10¢, 25¢, 50¢	Satisfactory	Some difficulty	Good when annealed between edge rolling and coining	Edge rolling produced severe and extensive cold work at rim; design did not come up in areas adjacent to rim unless annealed after upsetting

(a) Coining pressure used for 10-cent, 25-cent, and 50-cent coins was 65, 105, and 135 tons, respectively. Pressure was established with standard 90 silver-10 copper alloy blanks.

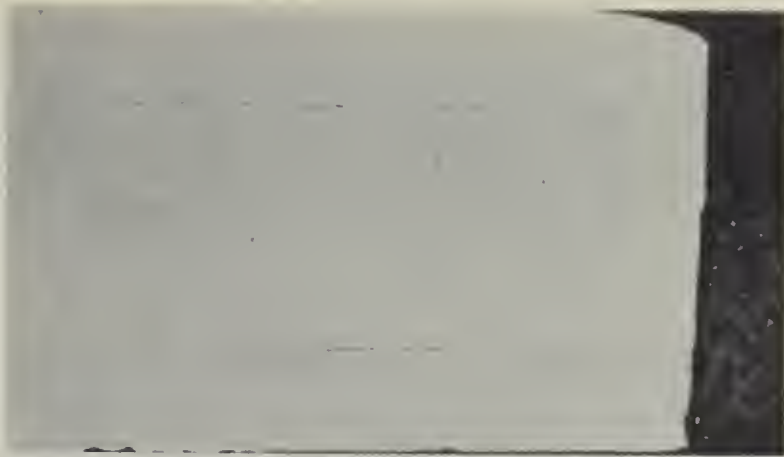
(b) In addition to the 50 silver-50 copper alloy, the following silver-copper alloys, modified silver-copper alloys, and nickel silver were struck.

Code	Composition, per cent			Zinc	All of these alloys coined well.
	Silver	Copper	Nickel		
K	50	40	5	5	
L	40	50	5	5	
M	33.3	66.7	-	-	
N	40	58	-	-	
P	30	88	-	-	
Q	20	78	-	-	
R (Nickel Silver)	0	65	18	17	

(c) Edge rolling produced a roughened surface near the edge of the coin in some instances. The effects were noticeable after coining. This problem could probably be controlled by modification of rolling-and-annealing procedures.



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19421

FIGURE D-2. EDGE OF BLANKED CUPRONICKEL-ON-COPPER COMPOSITE  
MAGNIFIED 50 TIMES



19422

FIGURE D-3. EDGE OF UPSET BLANK OF CUPRONICKEL-ON-COPPER  
COMPOSITE MAGNIFIED 50 TIMES

## D-8

over-annealing of the material. However, it is felt that this condition could be corrected easily by proper selection of the annealing conditions. It was also noted that the edge-rolling operation cold worked the edge of the blank to a greater depth than anticipated. During the subsequent coining operation, this condition appeared to cause trouble in getting a full development of the lettering in the design that is adjacent to the rim of the blank. This condition was particularly severe in the austenitic stainless steels and the nickel-5 silicon alloy. To alleviate this would require an extra annealing treatment after upsetting or edge rolling to soften the rim of the coin. To prevent buckling of the blanks during upsetting, it would probably be better to anneal following the upsetting, rather than before. This would also soften the material in the outer portion of the blank. This procedure was actually tried with another set of the nickel-5 silicon blanks and the results were satisfactory.

Figures D-4, D-5, and D-6 show the results of coin-striking experiments. The coining operation revealed difficulties in striking zirconium metal, stainless steel, and Monel. However, the magnitude of the coining pressure for all these experiments with the alternative materials was established by trials with the current silver-base alloy as a standard. As a result, some of the alternatives might have shown up more favorably if higher pressures had been employed during coining. However, as indicated earlier, the cold work introduced into the rim area of the coin during edge rolling results in a low capacity for plastic flow in this region during coining. This deficiency might be mitigated by annealing the upset blank before coining, as was done with the nickel-5 silicon alloy.

In general, it may be concluded that the stainless steels, whether they are the austenitic or the straight-chromium types, would be difficult to coin with the present equipment. On the other hand, a stainless steel has recently been developed by Republic Steel Corporation, which promises to have higher coinability than the other stainless steels. The alloy has not been tested in Mint coining dies, however. Nickel-chromium alloys and Monel also lack coinability. However, the lack of coinability of most of these alloys would be only one part of the Mint's problem. As mentioned earlier, these materials also require different melting procedures than used with present alloys, and they require hot-rolling equipment. Furthermore, annealing of the austenitic stainless steels requires fairly high temperatures (about 1900-2000 F), followed by a water quench. Such facilities are not now available. Nickel, nickel silvers, and the nickel-5 silicon alloy are not as difficult to handle as are the stainless steels but, with the possible exception of nickel-silver alloys, the Mints are not now equipped to handle their melting and rolling.

The coinability of zirconium was found to be questionable, and further experimentation is needed. Although titanium was not tried at the Mint, its properties indicate that it would be very difficult to coin. No experiments were made in coining pure nickel, but its coinability has been well established by the Canadian Mint, which now makes a five-cent coin from pure nickel. Thus, from the standpoint of coinability, the acceptable white metals are: nickel, cupronickel, columbium, the silver-copper alloys and their modifications, and composites consisting of cupronickel clad on copper and coin silver clad on copper.



D-9



19706

FIGURE D-4. EXPERIMENTAL STRIKES MADE AT THE PHILADELPHIA MINT ON 25-CENT-SIZE DIES

- F: 75 Copper - 25 Nickel
- 103: Cupronickel - Copper Multilayer Composite
- D-2: 50 Silver - 50 Copper
- 102: Coin Silver - Copper Multilayer Composite

D-10



19705

FIGURE D-5. EXPERIMENTAL STRIKES MADE AT THE PHILADELPHIA MINT ON 25-CENT-SIZE DIES

- 101: Columbium, Vendor I
- 110: Columbium, Vendor II
- 107: Zirconium
- 105: Monel



D-11



19708

FIGURE D-6. EXPERIMENTAL STRIKES MADE AT THE PHILADELPHIA MINT ON 25-CENT-SIZE DIES

108C: Nickel-5 Silicon with magnetic core (bright annealed after upsetting)

G: Type 301 Stainless Steel, Vendor I

106: Type 301 Stainless Steel, Vendor II

109: Type 302 Stainless Steel

D-12

Conclusions

The results of the blanking, upsetting, and coining experiments, considered in conjunction with the other Mint processes, lead to the general rating of alternative materials shown in Table D-2.

TABLE D-2. GENERAL RATING OF ALTERNATIVE COINAGE MATERIALS<sup>(a)</sup>

Material	Mint Operations					Remarks
	Melt	Roll	Blank	Upset	Coin	
75 Copper-25 nickel (cupronickel)	+	+	+	+	+	
All silver-copper alloys and their modifications	+	+	+	+	+	Slight modifications in rolling and coining
Cupronickel clad on copper	-	+	+	+	+	Adjustments in upsetting required
Coin silver clad on copper	-	+	+	+	+	Adjustments in upsetting required
Columbium	-	0	+	+	+	
Zirconium	-	0	+	+	0	
Nickel-silicon	-	0	+	+	+	Some change in annealing procedure required
Monel	-	0	+	+	-	
Austenitic stainless steel, Type 301	-	-	+	0	-	
Austenitic stainless steel, Type 302	-	-	+	0	-	
Nickel <sup>(b)</sup>	-	-	+	+	+	
Titanium <sup>(c)</sup>	-	-	+	+	-	

(a) The rating key is as follows:

+ = Satisfactory now

0 = Needs some modification or further experimentations

- = Not feasible now.


(b) Coinability rating based on Canadian Mint experience.

(c) Titanium not actually tested, but coinability rating based on its properties.



# PHOTOGRAPHY IN THE ECONOMY





*"We have long been accustomed to the enrichment of our lives by photography. Photography gives us remembrances of our loved ones, records of today's events as they become tomorrow's history and art forms which enrich our culture. Familiar too, is photography's contribution in the laboratory, the hospital and the classroom."*

LYNDON B. JOHNSON



## The Silver Image

### PHOTOGRAPHY

MORE THAN 52 million Americans captured the smiles of their children, recorded their vacations, anniversaries and weddings, together with a host of other personal remembrances by taking more than 2½ billion pictures in 1964.

During that same year, the medical and dental profession processed about half a billion X-rays as part of the diagnosis and treatment of illness and disease, thus contributing immeasurably to the health and longevity of the nation's citizens.

The common denominator to both is the use of the photographic process—the unique ability of a silver salt to record an image when exposed to light.

Today photography affects the life of every individual in this country in many ways. If not through “medicine” or “picture taking”, then because of the role it plays in our national defense effort or as it works for industry to assure its continuing ability to keep pace with technology. A photograph speaks a universal language and is, therefore, indispensable in communications, education and entertainment.

PHOTOGRAPHY PLAYS A VITAL ROLE IN OUR NATION'S ECONOMY — AND SILVER PLAYS AN INDISPENSABLE ROLE IN PHOTOGRAPHY.

The photographic industry is entirely dependent upon systems for image reproduction that utilize silver-based salts. There are no satisfactory alternates or substitutes for silver in the photographic process and, despite extensive research, there are no technological changes to non-silver systems anticipated.

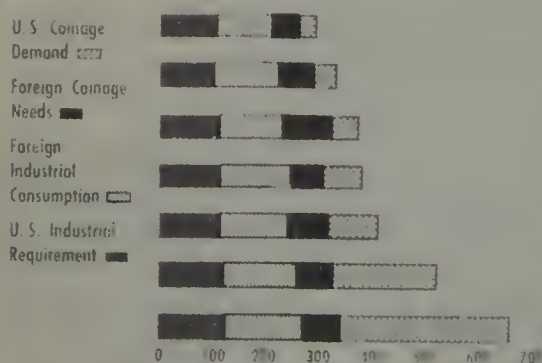
EVERY USER OF THIS INDUSTRY'S PRODUCTS, AS WELL AS EVERY MEMBER OF THE INDUSTRY ITSELF, IS, THEREFORE, CONCERNED WITH INSURING THAT THE SUPPLY OF SILVER FOR THIS VITAL INDUSTRIAL USE IS MAINTAINED.

## What Has Happened to Silver?

As the photographic industry has grown and its need for silver increased, so have other industrial uses until today the world consumption of silver for industrial purposes alone exceeds total world production. In 1964 this deficit amounted to over 70 million ounces

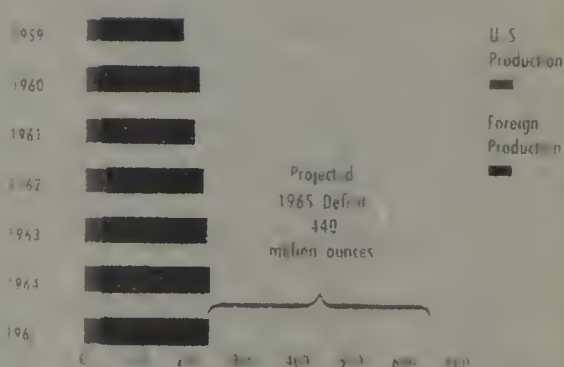
to which must be added an additional deficit of 61 million ounces used in foreign coinage and the staggering 203 million ounces used in minting silver coins in the United States. The total deficit for 1964 was over 350 million ounces.

### CONSUMPTION



Silver Users Association

### PRODUCTION



The additional silver needed has largely been supplied from U. S. Treasury stocks of silver through the redemption of silver certificates. This stock, the largest in the world, has been reduced from nearly 2 billion ounces at the beginning of 1963 to slightly over 1 billion ounces at present. At the current rate of demand, this supply will be completely exhausted by 1967.

The price at which the Treasury, by law, redeems silver certificates is \$1.293. This is over 40% more than silver sold for in 1961. Without Treasury stocks the price will skyrocket and in a short time the lack of available silver at any price could cause a serious curtailment in the manufacture of products using this metal.

Vital uses of film in the defense

effort where, for example, it is indispensable in aerial reconnaissance, would be continued at greatly increased costs to the Government and taxpayer. Since the Government is the largest purchaser of sensitized photographic material, the burden would be substantial. Medical, dental and scientific research would continue to require film. Banks and other commercial and industrial user where photography is necessary for recordkeeping, product analysis and research would have a continuing need. Newspapers, magazines and other periodicals where graphic arts represents the life blood would be supplied, but all would face mounting prices and reduced supply. Many amateur photographers faced with increased costs would cut back



their photographic expenditures or possibly be forced to turn to other interests.

#### THE REMEDY

The solution to the silver problem lies in insuring that silver for industrial purposes is available equitably to all users. The elimination of silver in half dollars, quarters and dimes would place industrial use and production closer to balance. In coinage, unlike

photography, silver serves no real purpose. Coins are a medium of exchange and need have no "intrinsic value" as witnessed by the nickel and the penny, neither of which contain silver but both of which are readily accepted because people have faith in the Government of the United States. "Intrinsic value" is an argument advanced largely for sentimental reasons or by those who seek the retention of silver for their own special interest.

## Photography—A Basic Industry



(From Fortune Magazine, September 1964)

## How Important is Photography?

### To National Defense

1 • In 1962, with the aid of aerial photographs, "Not only was the CIA, with its collaborators in military intelligence services, able to pinpoint and count the rockets in Cuba and to measure their degree of readiness; it was also able to tell the President almost exactly how the Soviet strategic order of battle across the world—bombers and rockets and long range submarines—compared to our own."

(Fortune Magazine, December 1964)

2 • Aircraft are completely X-rayed periodically to detect stresses and fatigue.

3 • Tanks, guns and other equipment are X-rayed for structural defects.

4 • Innumerable training films have been produced for use by the Armed Services.

5 • The fuel in every Minuteman and similar missiles is X-rayed twice before it is placed in a silo and once thereafter every six months.

### **To Space Exploration**

1 • High-speed color films are used in instrument recording and photo documentation.

2 • In satellite flights, miles of sensitized paper are used to record oscillographs which show technical information, e.g., temperature, pressure, velocity, acceleration and vibration.

3 • X-ray films are used to find flaws in welded seams of rockets and satellites and also to inspect solid fuel and the electrical components of rockets.

4 • Photo-sensitive plates are used in the production of integrated circuits.

5 • Every astronaut has carried cameras for still and movie pictures which have contained special films designed specifically for use in space flights.

### **To the Health of Our Citizens**

1 • Over 40,000 persons are employed in diagnostic work in hospitals. Radiology is the basic component in diagnostic systems.

2 • The number of people receiving X-ray diagnosis doubles every eight years.

3 • In the last 15 years, per capita use of X-ray film has doubled.

4 • Photography is increasingly used to record surgical procedures and for photo-biological examination as well as other laboratory work.

### **To the Education of Our Children and Adults**

1 • Over 340,000 still and movie projectors are in use in United States public schools.

2 • In 1963 over \$200 million of audio-visual expenditures were on educational applications of photography.

3 • Religious organizations and community groups spent \$40 million on audio-visual equipment and supplies in 1963.

4 • Recent advances in programmed learning require the use of photography—teaching machines, etc.

### **To the Printing and Publishing Industries**

1 • There are over 9,000 local, daily and weekly newspapers in the United States, employing approximately 15,000 press photographers, owning 27,000 cameras and publishing 9 million pictures per year.

2 • The printing and publishing industry is dependent on photography. In 1963, this industry employed 919,000 people and had a value of output of \$10.5 to \$16 billion.

3 • Modern production techniques such as photo-typesetting are finding increasing usage.

4 • Graphic arts, encompassing all forms of pictorial printing is based on photography.

### **To Science and Industry**

1 • Ten thousand industrial and business firms have special photographic departments.

2 • Photography is an essential tool of law enforcement and fire-fighting agencies.

3 • Photography is instrumental in oil exploration.

4 • The records for the millions of Americans covered under the Social



Security system are kept in the form of microfilm.

5 • Virtually all of the 14,000 commercial banks in the United States use microfilm systems in their operations.

6 • Many business concerns, department stores, insurance companies, libraries, etc., depend on photographic systems for record storage and retrieval and for their day-to-day operations.

### **To the Recreation and Entertainment of Our Population**

1 • There are 43 million still cameras and 7 million movie cameras in use by

picture takers in the United States

2 • About 85% of television shows that appear during prime viewing hours are recorded on film. These programs are transmitted by 648 television stations and are viewed by Americans on 62,000,000 receivers. Many persons in the TV industry are dependent on photography.

3 • Forty-six million persons attend 17,800 U. S. motion picture theaters each week. These theaters employ 173,000 people.

4 • There are about 20,000 camera clubs in the United States.

## **The Photographic Industry as a Factor in the Economy**

1 • Over 530 photographic manufacturing establishments employ 65,000 people and pay them over \$½ billion annually. In 1963, these establishments had shipments of over \$1.8 billion at manufacturer's prices.

2 • There are over 200,000 retail outlets which sell over \$2½ billion of photographic products at consumer purchase value.

3 • In 1964, many people were involved in exporting \$180 million of photographic goods and importing \$110 million of these products. The photographic industry contributes favorably

and significantly to the United States balance of payments situation.

4 • There are several thousand photo-finishing laboratories in the U. S. which employ 20,000 people.

5 • There are more than 150,000 people engaged in professional photography in the United States. This includes over 20,000 photographic studios, with an annual business of \$400 million, employing in excess of 30,000 people.

6 • Sixty thousand persons are engaged in the production and distribution of professional motion pictures, including those for use in television.



FACT: Silver consumption exceeds silver production.

FACT: Silver is indispensable in photography — there is no substitute.

FACT: The photographic industry and the users of its products contribute significantly to the well being of the nation.

FACT: Elimination of silver from subsidiary coinage will free the limited supplies of silver to aid in continuing the nation's industrial growth.

NATIONAL ASSOCIATION OF PHOTOGRAPHIC MANUFACTURERS, INC.

10 Rockefeller Plaza • New York, N. Y. 10020





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# THE SILVER MARKET IN 1964

49th Annual Review compiled by **HANDY & HARMAN**

## HIGHLIGHTS OF THE

**There have been few years when silver has commanded as much public interest as during 1964.**

The unprecedented rise in the amounts of silver being used by the United States Mints to meet the chronic coin shortage in this country has directed world-wide attention to the fundamental problem of future availability of silver. It is becoming more and more apparent that in the long run there will not be enough silver to satisfy the current rate of industrial and coinage needs combined.

**In spite of intense world-wide speculative interest in silver, the price for prompt delivery in New York during 1964 enjoyed a degree of stability not experienced since 1960.**

The quotation of 129.3¢ per troy ounce, which was first reached on September 9, 1963, remained unchanged throughout the year. The reason for this, of course, was the availability of Treasury silver through the redemption of silver certificates, which established an effective price ceiling.

**We estimate that the amount of silver consumed in the United States for industrial purposes during 1964 amounted to about 123,000,000 ounces, an increase of about 11% over 1963.**

Increases in the use of silver in the United States occurred in all major industrial categories. The most significant increase took place in the use of silver for sterling silverware. Continued growth in the electrical and electronic industries accounted for more silver being consumed in this category as well.



## SILVER MARKET IN 1964

**Total Treasury silver stocks, including bullion and silver dollars, declined by 364,500,000 ounces during 1964, a drop of about 23%.**

Most of this decline was accounted for by use of 203,000,000 ounces in coining half-dollars, quarters and dimes. Another important factor was the withdrawal of 141,000,000 ounces through the redemption of silver certificates by the public.

**We believe that continued stability in the New York published price for silver can be reasonably expected throughout 1965.**

In order to discourage hoarding and to keep our present silver subsidiary coin in circulation, the Treasury will be most interested in preventing an increase in the price of silver. Even after Congressional action is taken on coinage, it will probably take some time to effect a changeover, during which period the Treasury will need to continue protecting existing coin.

**We believe that the United States will ultimately have to adopt a non-silver subsidiary coin.**

An analysis of available statistical evidence seems to us to point inevitably to the abandonment of silver for coinage. The fundamental question is whether it will be done sooner or later. Prompt authorization of a non-silver subsidiary coin would accomplish the double purpose of providing for an adequate coinage supply in the future and of preserving our valuable Treasury stocks for more essential uses.

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By HANDY & HARMAN



## REVIEW OF THE SILVER MARKET FOR 1964

There have been few years when silver has commanded as much public interest as during 1964. The unprecedented rise in the amounts of silver being used by the United States Mints to meet the chronic coin shortage in this country has directed world-wide attention to the fundamental problem of future availability of silver. It is becoming more and more apparent that in the long run there will not be enough silver to satisfy the current rate of industrial and coinage needs combined. United States Treasury stocks are still very large, but the rapid decline in these stocks during 1964 created a widespread belief throughout world markets that higher prices were imminent. Buying for speculation and for inventories resulted, and such buying was particularly heavy during the last four months of the year.

### THE NEW YORK MARKET

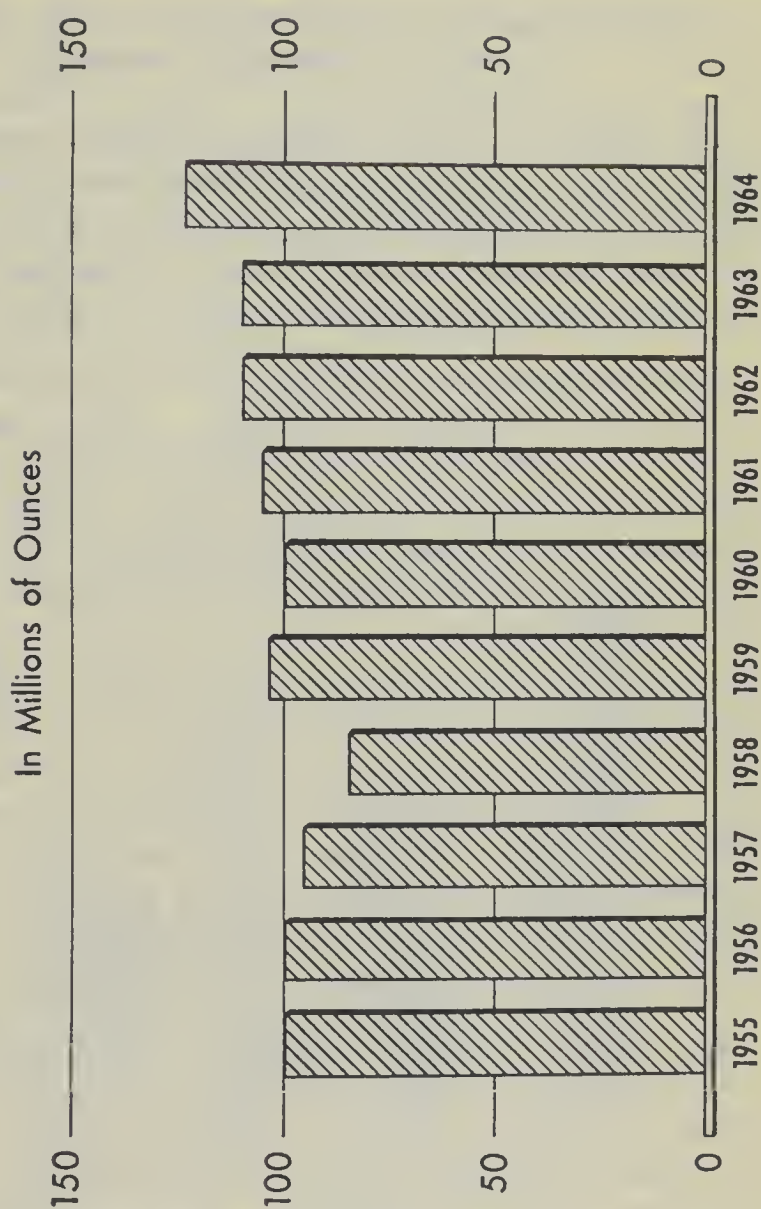
In spite of intense world-wide speculative interest in silver, the price for prompt delivery in New York during 1964 enjoyed a degree of stability not experienced since 1960. The quotation of 129.3¢ per troy ounce, which was first reached on September 9, 1963, remained unchanged throughout the year. The reason for this, of course, was the availability of Treasury silver through the redemption of silver certificates, which established an effective price ceiling. A condensed long range price chart, together with brief explanatory notes, is included in this Review.

In contrast to the stability in the price for prompt delivery, prices on the Commodity Exchange for future delivery reached new highs. Nearly 104,000,000 ounces were traded during the year at prices ranging from a low of 128.5¢ per troy ounce to a high of 138.5¢. Open interest on the Exchange increased from about 10,000,000 ounces to about 30,000,000 ounces. Actual physical stocks on deposit at approved Commodity Exchange warehouses at the end of 1964 amounted to about 2,500,000 ounces as against 450,000 ounces at the beginning of the year.

Several bills relating to silver and silver coinage were introduced in Congress during 1964. These bills, while purporting to solve the coinage problem, would have had the effect of increasing the price of silver. On April 1st and 2nd hearings on one of these bills (S. 2671) were held before the Senate Banking and Currency Committee, and on August 13th hearings on several others (H. R. 10534 and related bills) were held before the House Banking and Currency Committee. No action was taken by either of these Committees or by Congress, but much of the testimony presented suggested an early possibility of higher silver prices, and the publicity this testimony received added impetus to speculative buying, particularly abroad.



*Industrial Consumption of Silver in the  
United States 1955-1964.*



## INDUSTRIAL CONSUMPTION OF SILVER IN THE UNITED STATES

We estimate that the amount of silver consumed in the United States for industrial purposes during 1964 amounted to about 123,000,000 ounces, an increase of 11% over 1963. A ten-year summary in chart form of industrial consumption of silver in the United States appears on page 7.

Increases in the use of silver in the United States occurred in all major industrial categories. The most significant increase took place in the use of silver for sterling silverware. Early in 1963, prices for sterling silver articles at the retail level went up as the result of the rapid rise in the market price of silver which had taken place during 1961 and 1962. Higher prices created some buyer resistance which in turn resulted in a reduction in the number of items sold. This resistance proved temporary, however, and recovery in sterling silverware during 1964 was substantial, even exceeding expectations. Continued growth in the electrical and electronic industries accounted for more silver being consumed in this category as well. Somewhat smaller rates of increase took place in the use of silver in brazing alloys for metal joining and in silver nitrate for photographic purposes.

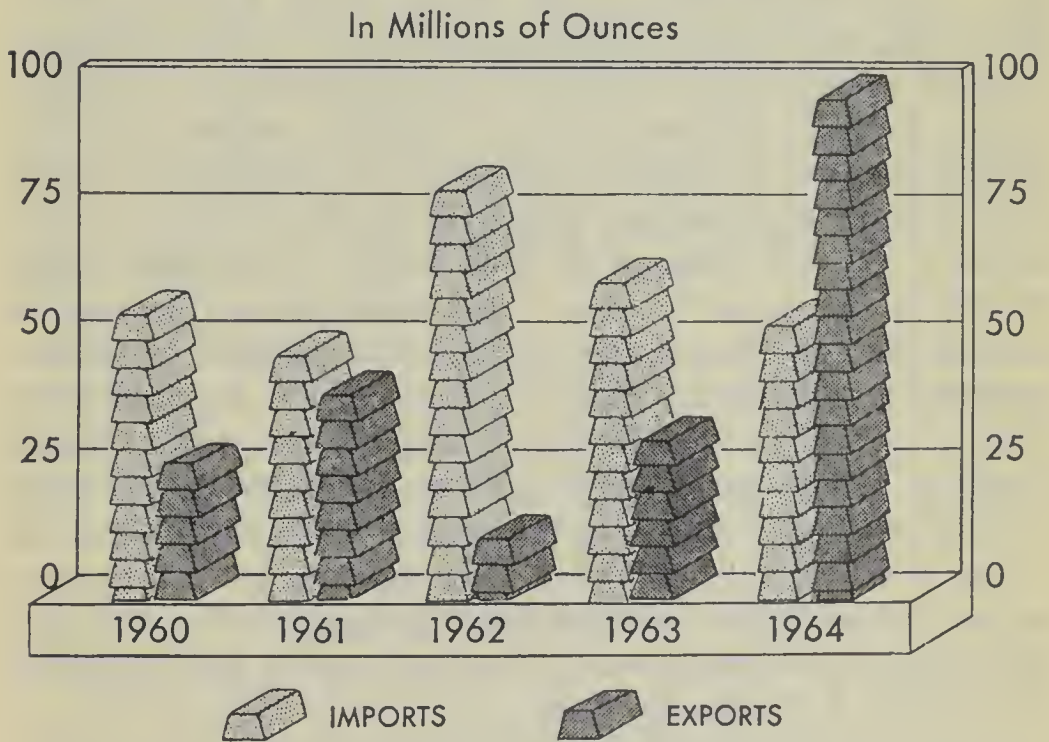
## UNITED STATES IMPORTS AND EXPORTS

For the first time since the lend-lease shipments of World War II the United States was a net exporter of silver. Total exports amounted to 99,000,000 ounces, more than triple the 1963 figure, while imports declined to 54,000,000 ounces from 64,000,000 ounces in the previous year.

The only major producing country from which imports increased was Canada which supplied some 20,500,000 ounces,

about 10% over 1963. Imports from Mexico, which included about 3,000,000 ounces of demonetized silver coins, amounted to about 11,000,000 ounces, a drop of nearly 40% from the previous year. Peru shipped 10,500,000 ounces, a decline of more than 30%, and about 9,000,000 ounces were received from all other Western Hemisphere countries combined. From outside the Western Hemisphere a total of 3,000,000 ounces were imported, of which Australia was the major contributor with shipments of about 1,700,000 ounces.

### *Silver Imports—Exports*



Exports to most countries were substantially ahead of 1963. The United Kingdom received 48,000,000 ounces, nearly six times as much as in 1963. Shipments to France totaled about



14,000,000 ounces, about twice the previous year; and to Western Germany, 10,000,000 ounces, almost five times the 1963 figure. Other exports included 4,500,000 ounces to Italy; 7,000,000 ounces to Japan; 5,000,000 ounces to Canada; 7,500,000 ounces to Switzerland; 1,600,000 ounces to Belgium; and 1,000,000 ounces to The Netherlands. The balance of 400,000 ounces was accounted for by a number of small shipments.

### TREASURY SILVER

Total Treasury silver stocks, including bullion and coin, declined by 364,500,000 ounces during 1964, a drop of about 23%. Most of this decline was accounted for by silver used for coining half-dollars, quarters and dimes. The Treasury obtained authority from Congress for an additional 45,000,000 silver dollars, but none were actually minted. About 203,000,000 ounces of silver were used for subsidiary coin in 1964, compared to the 1963 figure of 111,500,000 ounces. As recently as 1960 coinage in this country consumed only 46,000,000 ounces, yet in spite of this extraordinary increase in consumption of silver, a coin shortage still persists. It seems probable that at least part of the problem has resulted from mass hoarding of coins, and this is certainly true in the case of Kennedy half-dollars. During 1964 about 201,000,000 of these half-dollars were minted, using about 72,700,000 ounces of silver, or nearly 36% of all the silver used for subsidiary coin in the United States. Virtually all have gone into collectors' hands or into hoarding and are not performing their intended function as a circulating medium.

Another important factor in the decline in Treasury stocks was the withdrawal of 141,000,000 ounces of silver through the redemption of silver certificates by the public. For the first eight months of the year, the average monthly withdrawal

rate amounted to less than 5,000,000 ounces. This was in line with projections made earlier in the year, but starting in September the rate jumped sharply. During the last four months of 1964 a total of over 100,000,000 ounces, or an average of 25,000,000 ounces a month, were withdrawn. In addition to withdrawals through redemption of silver certificates, the Treasury also sold approximately 10,000,000 ounces to other government agencies for defense purposes.

For the past several years there has been an increasing demand for silver dollars, which up until 1964 were obtainable by presenting silver certificates. On March 25, 1964 the Treasury announced that the supply was virtually exhausted and that no more silver dollars would be released. This did not affect the redemption of silver certificates for silver bullion. Only the silver dollar as a coin was involved. There were about 3,000,000 silver dollars remaining in the Treasury on December 31, 1964 compared to about 28,500,000 at the beginning of the year.

World War II lend-lease silver accounts have now been virtually settled. The only remaining items are nominal amounts still open with India and Pakistan. We understand that settlement of these amounts is awaiting final determinations of the silver content of materials already delivered.

## REVIEW OF OTHER MARKETS

Consumption of silver for industrial purposes outside the United States, excluding Communist dominated areas, during 1964 amounted to about 162,900,000 ounces, an increase of 15% over 1963. Consumption for coinage, excluding the United States, also increased, in this case by 11%. This increase in coinage was not general, however, but was due to a special

coinage program in Japan to commemorate the 1964 Olympics. Without this factor coinage consumption outside of the United States would in fact have declined somewhat. Developments in individual centers are summarized below.

*LONDON*—Prices for prompt silver in London ranged from a low of 111 $\frac{5}{8}$ d on May 21st to a record high of 112 $\frac{1}{4}$ d on September 17th. These price changes were largely attributable to fluctuations in the exchange rates and were equivalent to 130.21¢ and 130.16¢ an ounce, respectively.

Consumption of silver in the United Kingdom for industrial purposes amounted to about 23,000,000 ounces, an increase of 15% over 1963. Total imports into the United Kingdom during the first eleven months of 1964 amounted to about 54,000,000 ounces. The United States was the principal source having shipped 40,300,000 ounces. About 5,100,000 ounces were received from Australia and about 9,000,000 ounces from all other countries combined. Silver exported during the first eleven months of 1964 totaled 18,700,000 ounces. Italy was the largest overseas buyer, taking 4,900,000 ounces. About 3,600,000 ounces were shipped to West Germany; 3,100,000 ounces to France; 2,700,000 ounces to Belgium; and about 4,400,000 ounces to miscellaneous other countries. It is estimated that in 1964 the Bank of England recovered about 2,000,000 ounces of silver from demonetized British coins and sold about 1,800,000 ounces in the market. Foreign coinage orders executed by the Royal Mint required about 1,000,000 ounces.

*WEST GERMANY*—Consumption of silver in West Germany in 1964 for industrial purposes is estimated at 46,300,000 ounces, an increase of about 14% over 1963. Domestic mine



production in Germany is small, therefore nearly all of Germany's requirements must be imported. Imports amounted to about 44,700,000 ounces, of which about 32,800,000 ounces were received from the Western Hemisphere, and 11,900,000 ounces from Europe and all other countries combined. West German exports totaled approximately 16,000,000 ounces and were delivered to Italy, Belgium, Austria, Switzerland and France. The silver 5 Deutsche Mark coins are still being minted in Germany. In the absence of detailed information we are estimating that approximately 1,500,000 ounces were used for this purpose, about the same as in 1963.

*FRANCE*—The French coinage program which began in 1959 with the minting of the 5 Franc silver coin continues to be important. According to the Paris Mint, a new 10 Franc coin was minted in 1964 and scheduled for release January 1, 1965. The new coin is reported to weigh 25 grams and is 900 fine containing .72 ounces of silver. The face value of the new coin is about \$2.04 in U. S. currency. The Mint purchased an estimated 13,800,000 ounces in 1964 and used about 10,500,000 ounces for coinage. Its stocks at the year end amounted to about 10,000,000 ounces and it is anticipated that about 7,000,000 ounces will be used in 1965.

Industrial consumption in France during 1964 amounted to about 14,900,000 ounces, an increase of approximately 1,000,000 ounces over the previous year. Imports totaled 29,900,000 ounces, of which about 18,100,000 ounces were received from the Western Hemisphere; 4,200,000 ounces from the United Kingdom; and 7,600,000 ounces from various other countries. Exports to various destinations amounted to about 3,400,000 ounces.

*ITALY*—There continued to be minting of silver coins in Italy under the coinage programs authorized in 1958 and 1961. According to the information available to us only about 1,000,000 ounces were used for this purpose in 1964, although the Italian Mint is reported to have acquired an estimated 6,000,000 ounces during the year. Complete information on imports is not available, but we understand that about 4,900,000 ounces were shipped from the United Kingdom; 4,500,000 ounces from the United States; and various amounts from France, West Germany and other countries. Details are lacking on the amounts of silver used for industrial purposes but we estimate that about 20,000,000 ounces were consumed.

*CANADA*—We estimate that consumption of silver for industrial needs in Canada amounted to about 4,800,000 ounces which was a small increase over 1963. The Royal Canadian Mint consumed 13,700,000 ounces for coinage in 1964, slightly more than was used in 1963, and purchased about 9,300,000 ounces. The difference presumably came from existing government stocks.

Production in Canada during 1964 is estimated at 31,000,000 ounces, an increase of about 1,100,000 ounces over the previous year. Exports of silver in refined and unrefined form to the United States totaled 20,500,000 ounces, an increase of about 10% over 1963. Imports of silver from the United States amounted to 5,000,000 ounces, a decline of about 3,100,000 ounces from the previous year.

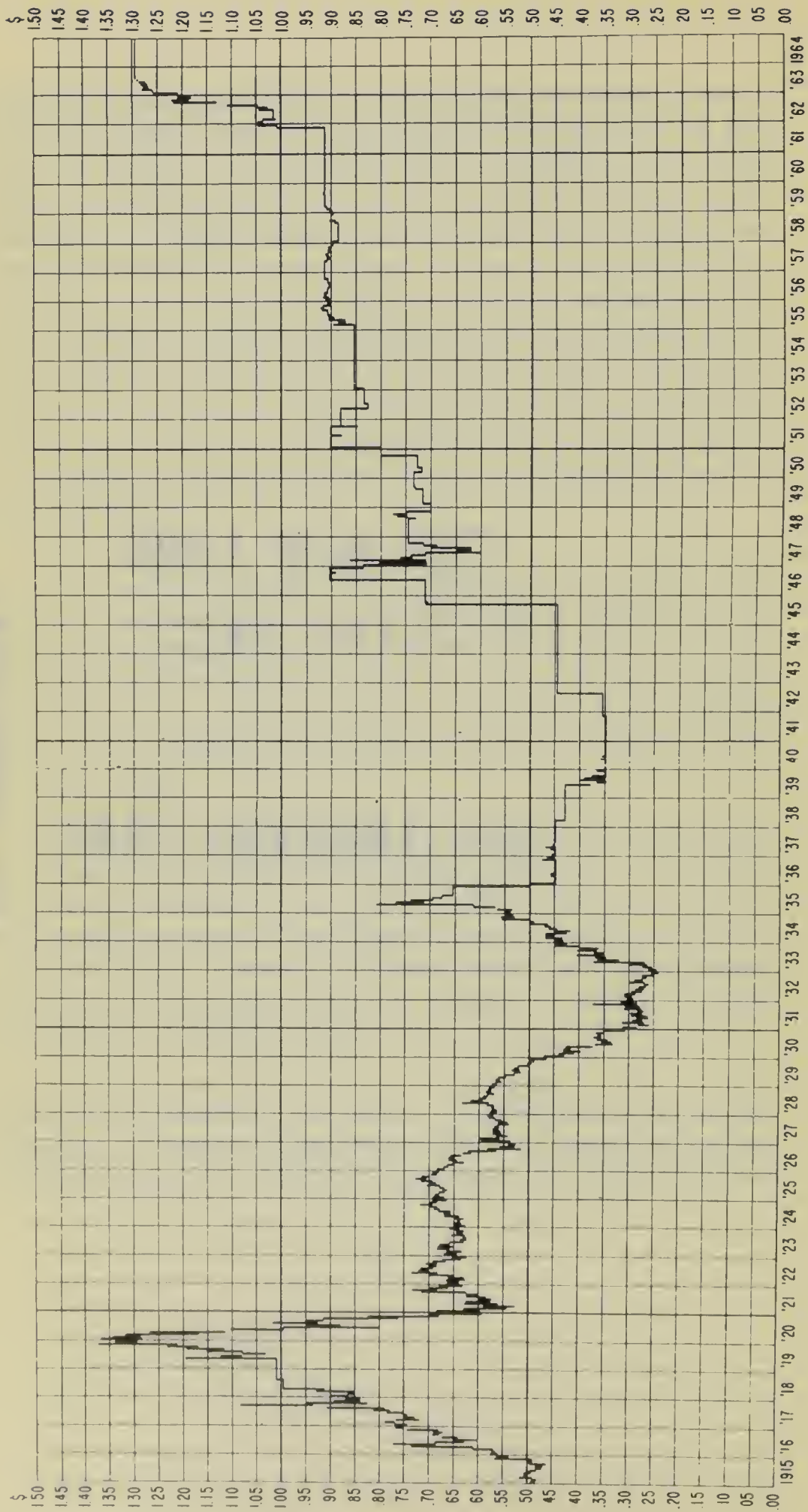
*MEXICO*—Production of silver in Mexico during 1964 amounted to about 41,000,000 ounces, a decline of about 2,000,000 ounces from the preceding year. It is reported that

**THE NEW YORK  
SILVER PRICE**

**1915 THROUGH 1964**



THE NEW YORK SILVER PRICE  
1915 THROUGH 1964



## HISTORICAL HIGHLIGHTS

- 1919** – The quotation reached the all-time high of  $137\frac{1}{2}\text{¢}$  on November 25, 1919 due to strong demand for silver during the reconstruction period after World War I.
- 1932** – The silver price declined to a record low of  $24\frac{1}{4}\text{¢}$  on December 29, 1932 following a period of poor demand caused by deflation, depression of world trade, demonetization and debasement of coinage.
- 1935** – The quotation reached  $81\text{¢}$  on April 26, 1935 as the result of heavy speculative buying due to the silver purchase program of the United States Government.
- 1942** – Wartime price controls were established.
- 1950** – The market was stabilized by the operations of the  
to Mexican and United States Governments.
- 1961**
- 1961** – On November 28, 1961 the United States Treasury suspended sales of silver to domestic industry.
- 1963** – On September 12, 1963 the first large scale redemption of silver certificates took place. The effective cost of  $129.3\text{¢}$  an ounce established a new ceiling price for silver.

an increase in production is likely but is not expected before 1966. Consumption for industrial requirements increased to 4,000,000 ounces from the 3,200,000 ounces used in 1963, but only about 800,000 ounces were used for coins, all of which were one-peso 10% silver alloy coins. Exports of silver from Mexico amounted to 29,500,000 ounces, approximately 27% less than 1963. Most of this silver was shipped to West Germany and the United States. Withdrawals from circulation of demonetized coin produced only about 500,000 ounces, considerably less than the 2,700,000 ounces recovered in 1963. Government stocks at December 31, 1964 are estimated at about 14,000,000 ounces, and there may still remain 60,000,000 to 65,000,000 ounces of silver in the hands of the public in the form of demonetized coin.

*JAPAN*—Industrial consumption of silver in Japan during 1964 amounted to about 20,000,000 ounces. Japanese coinage required a total of 16,300,000 ounces. This was a sharp rise over the 5,000,000 ounces used for coinage in 1963 and is attributable to the minting of special silver coins commemorating the World Olympics held in Tokyo during the year. About 13,500,000 ounces of the amount used by the Japanese Mint were obtained from government stocks and the remaining 2,800,000 ounces from domestic sources and imports. The government stocks at the year end, including wartime confiscated silver that was released and transferred to the Japanese Government, is reported at about 23,500,000 ounces. About 1,600,000 ounces of "confiscated" silver was released to private sources during 1964. Silver production in Japan is estimated at 15,700,000 ounces, an increase of approximately 5% over the previous year. Information regarding Japanese imports for the full year is not available but if our estimates are



correct, about 9,500,000 ounces were received, with more than half this amount coming from the United States.

*INDIA*—The Bombay market continues to be virtually isolated and exerts little or no influence on other world markets. Imports of silver are prohibited, and exports are under strict control. According to reports received, however, silver is assuming growing industrial importance. The price fluctuated considerably during the year largely due to the growing imbalance in supply and demand. The highest price recorded during 1964 was Rs. 269.50 per kilo attained at the end of January and the lowest of Rs. 242.50 per kilo occurred in mid-June. These prices were equivalent to \$1.76 an ounce and \$1.58 an ounce, respectively. There was an unusual rise in demand for industrial uses including jewelry, and consumption is estimated at about 12,000,000 ounces. This compared with only 2,500,000 ounces reported for the previous year. The silver needed to satisfy this demand had to be obtained internally, since imports are prohibited, and this resulted in higher prices. We understand that about 10,000,000 ounces were obtained by melting down silver articles and cut coins.

### THE OUTLOOK

We believe that continued stability in the New York published price for silver can be reasonably expected throughout 1965. Our reasons for this opinion are:

(1) In order to discourage hoarding and to keep our present silver subsidiary coins in circulation, the Treasury will be most interested in preventing an increase in the price of silver. Public Law 88-36, which was passed on June 4, 1963, together with implementing Instructions of the Secre-

tary of the Treasury issued on June 22, 1963, provide the authority and the procedure for accomplishing this. For reference, the texts of both the Law and the Instructions are included in this Review as an appendix.

(2) Even after Congressional action on coinage, it will probably take some time to effect a changeover, during which period the Treasury will need to continue protecting existing coin.

(3) Treasury stocks are sufficient to prevent a price increase at least until a new coinage program has been completed.

It is difficult to see how a solution to the United States subsidiary coinage problem can be postponed very long. The nature and the timing of this solution will probably be the most important factors affecting the long range trend of the price of silver.

We believe that the United States will ultimately have to adopt a non-silver subsidiary coin. An analysis of available statistical evidence seems to us to point inevitably to the abandonment of silver for coinage. The fundamental question is whether it will be done sooner, or later. If the present rate of decline in Treasury stocks is not slowed, total withdrawals during 1965 could amount to as much as 400,000,000 ounces, most of which would be for coinage and speculation rather than industrial uses.

It is argued that we need intrinsic value in our subsidiary coin to maintain public confidence in the dollar. In our opinion this argument is not valid. Many industrialized nations today manage very well on a non-silver subsidiary coinage system. The fact is that we are now seeing why intrinsic

value can be a disadvantage. Our coins, just like our Federal Reserve Notes, are intended to be useful in transacting business. It is difficult to understand why intrinsic value should be considered important for a 10¢ piece but not a \$10 bill. Intrinsic value in a medium of exchange can be a serious disadvantage, and the high value of our present silver subsidiary coins has undoubtedly contributed to their shortage.

During Congressional hearings held in 1963 on Public Law 88-36 it was made very clear that one of the purposes of the law was to provide much needed stability to the silver market and that silver should be treated as a commodity and not as a monetary metal. The next logical step for Congress to take in carrying out the program begun in 1963 is the prompt authorization of a non-silver subsidiary coin in order to accomplish the double purpose of providing for an adequate coinage supply in the future and of preserving our valuable Treasury stocks for more essential uses.

December 31, 1964.



**WORLD SILVER CONSUMPTION**  
**(Excluding Communist Dominated Areas)**  
**(In Millions of Ounces)**

	1964	1963	1962	1961	1960
<b>Industrial Uses:</b>					
United States.....	123.0	110.0	110.0	105.0	100.0
Canada.....	4.8	4.6	4.6	4.5	4.3
Mexico.....	4.0	3.2	3.3	3.4	4.0
United Kingdom.....	23.0	20.0	20.0	20.0	16.5
France.....	14.8	13.9	13.5	14.0	13.0
West Germany.....	46.3	40.5	41.8	43.5	40.2
Japan.....	20.0	20.0	19.6	19.1	21.6
Other Countries.....	50.0	40.0	35.0	30.0	25.0
	285.9	252.2	247.8	239.5	224.6
<b>Coinage (a):</b>					
Canada.....	13.7	13.0	10.9	6.2	7.5
France.....	10.5	12.0	13.7	23.8	12.2
Italy.....	1.0	.5	3.5	5.6	7.1
Japan.....	16.3	5.0	1.4	1.4	4.6
Other Countries.....	20.0	25.0	20.7	44.2	26.5
Total Coinage (a).....	61.5	55.5	50.2	81.2	57.9
Total Consumption (a).....	347.4	307.7	298.0	320.7	282.5

(a) Consumption of silver for United States coinage has been excluded from these tables. Supplies needed for this purpose are obtained entirely from Treasury stocks and have never been part of market demand. The amounts consumed for the past five years have been as follows:

<u>1964</u>	<u>1963</u>	<u>1962</u>	<u>1961</u>	<u>1960</u>
203.0	111.5	77.4	55.9	46.0

**WORLD SILVER SUPPLIES**  
(Excluding Communist Dominated Areas)  
(In Millions of Ounces)

	1964	1963	1962	1961	1960
<b>New Production:</b>					
Mexico.....	41.0	42.8	41.2	40.3	44.5
United States.....	36.0	35.0	36.3	34.9	36.8
Canada.....	31.0	29.9	30.4	31.4	34.0
Peru.....	37.0	36.4	32.9	34.1	30.8
Bolivia.....	4.5	4.9	3.8	3.9	4.9
Other South and Central American Countries.....	9.5	9.1	7.1	8.6	7.8
Total Western Hemi- sphere.....	159.0	158.1	151.7	153.2	158.8
Outside the Western Hemi- sphere.....	56.0	55.0	54.0	50.0	49.0
Total New Production..	215.0	213.1	205.7	203.2	207.8
<b>Other Supplies:</b>					
U. S. Treasury Silver.....	151.0	25.2	.9	62.6	21.5
Stocks of Foreign Govern- ments.....	20.0	10.0	4.5	15.9	12.0
Demonetized Coin.....	20.0	15.0	20.0	30.0	10.0
Sales by Red China.....	—	—	25.0	55.0	9.7
Liquidation of Speculative Holdings and Inventory Reductions.....	—	40.0	35.0	—	—
Salvage and Other Miscel- laneous Sources.....	11.4	4.4	6.9	29.0	21.5
Total Other Supplies....	202.4	94.6	92.3	192.5	74.7
Total World Silver Supplies.....	417.4	307.7	298.0	395.7	282.5
Less Speculative Holdings and Inventory Accumula- tions.....	70.0	—	—	75.0	—
Available for Consumption....	347.4	307.7	298.0	320.7	282.5

**IMPORTS OF SILVER INTO THE  
UNITED STATES**  
(Excluding Lend-Lease Returns)  
(In Millions of Ounces)

	1964	1963	1962	1961	1960
Imported from:					
Canada.....	20.5	18.6	24.2	23.8	21.8
Mexico.....	11.0	17.7	15.3	8.1	11.0
Peru.....	10.5	15.3	15.9	7.2	11.8
Other Western Hemisphere Countries.....	9.0	9.3	6.8	6.0	6.7
Total Western Hemisphere.....	51.0	60.9	62.2	45.1	51.3
All Other Countries.....	3.0	3.1	14.2	3.8	4.8
Total Imports.....	54.0	64.0	76.4	48.9	56.1

**EXPORTS OF SILVER FROM THE  
UNITED STATES**  
(In Millions of Ounces)

	1964	1963	1962	1961	1960
Exported to:					
Canada.....	5.0	8.1	7.2	12.0	2.3
United Kingdom.....	48.0	8.3	1.6	5.9	5.7
France.....	14.0	7.3	—	4.3	7.4
West Germany.....	10.0	2.2	1.6	11.1	5.7
Italy.....	4.5	2.6	.3	2.5	.5
Japan.....	7.0	1.9	.4	3.5	4.5
All Other Countries.....	10.5	1.1	2.0	.5	.5
Total Exports.....	99.0	31.5	13.1	39.8	26.6



**TREASURY SILVER**  
(In Millions of Ounces)

	Dec. 31 1964	Dec. 31 1963	Dec. 31 1962	Dec. 31 1961	Dec. 31 1960
<b>Held in Treasury:</b>					
<b>Securing Silver Certificates:</b>					
Silver Bullion.....	1,190.3	1,532.5	1,654.5	1,730.5	1,741.8
Silver Dollars.....	2.3	22.1	72.7	100.7	124.9
Subsidiary Coin.....	7.5	2.7	2.4	2.6	2.0
Free Silver Bullion.....	17.9	25.2	37.0	28.5	123.5
<b>Total Treasury Stocks</b>	<b>1,218.0</b>	<b>1,582.5</b>	<b>1,766.6</b>	<b>1,862.3</b>	<b>1,992.2</b>
<b>Outside the Treasury:</b>					
Silver Dollars.....	372.6	352.9	303.6	276.4	252.5
Subsidiary Coin.....	1,559.3	1,365.2	1,270.3	1,194.0	1,140.0
<b>Total Silver Outside       the Treasury</b> .....	<b>1,931.9</b>	<b>1,718.1</b>	<b>1,573.9</b>	<b>1,470.4</b>	<b>1,392.5</b>
<b>Total Silver</b> .....	<b>3,149.9</b>	<b>3,300.6</b>	<b>3,340.5</b>	<b>3,332.7</b>	<b>3,384.7</b>

**SILVER QUOTATIONS**

	New York Price			London Spot		
	High	Low	Average	High	Low	Average
1964.....	129.300¢	129.300¢	129.300¢	112.250d	111.625d	111.923d
1963.....	129.300	121.000	127.912	111.750	103.875	110.126
1962.....	122.000	101.000	108.374	104.250	84.375	91.510
1961.....	104.750	91.375	92.449	88.750	79.375	80.225
1960.....	91.375	91.375	91.375	80.250	79.000	79.377
1959.....	91.625	89.875	91.202	80.250	75.875	78.827
1958.....	90.375	88.625	89.044	78.750	74.750	76.216
1957.....	91.375	89.625	90.820	80.500	77.125	78.931
1956.....	91.625	90.000	90.826	81.375	76.625	79.134
1955.....	92.000	85.250	89.099	80.250	73.750	77.542

## APPENDIX

23

## Public Law 88-36

## AN ACT

To repeal certain legislation relating to the purchase of silver, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

TITLE I—SILVER BULLION, SILVER  
CERTIFICATES, AND FEDERAL  
RESERVE NOTES

SECTION 1. The Silver Purchase Act of 1934 (31 U. S. C. 311a, 316a, 316b, 405a, 448-448e, 734a, and 734b), section 4 of the Act of July 6, 1939 (31 U. S. C. 316c), and the Act of July 31, 1946 (31 U. S. C. 316d) are hereby repealed.

SEC. 2. The Secretary of the Treasury shall maintain the ownership and the possession or control within the United States of an amount of silver of a monetary value equal to the face amount of all outstanding silver certificates. Unless the market price of silver exceeds its monetary value, the Secretary of the Treasury shall not dispose of any silver held or owned by the United States in excess of that required to be held as reserves against outstanding silver certificates, but any such excess silver may be sold to other departments and agencies of the Government or used for the coinage of standard silver dollars and subsidiary silver coins. Silver certificates shall be exchangeable on demand at the Treasury of the United States for silver dollars or, at the option of the Secretary



of the Treasury at such places as he may designate, for silver bullion of a monetary value equal to the face amount of the certificates.

SEC. 3. The first sentence of the ninth paragraph of section 16 of the Federal Reserve Act (12 U. S. C. 418) is amended by inserting "\$1, \$2," immediately after "notes of the denominations of".

## TITLE II--REPEAL OF TAX ON TRANSFERS OF SILVER BULLION

SEC. 201. (a) Subchapter F of chapter 39 of the Internal Revenue Code of 1954 (relating to silver bullion) is hereby repealed.

(b) The table of subchapters for such chapter 39 is amended by striking out the last line thereof.

(c) Section 6422 of such Code (relating to cross references) is amended by striking out paragraph (7) and by renumbering paragraphs (8), (9), (10), (11), (12), (13), and (14) as paragraphs (7), (8), (9), (10), (11), (12), and (13), respectively.

(d) Section 6808 of such Code (relating to special provisions relating to stamps) is amended by striking out paragraph (11) and by renumbering paragraphs (12) and (13) as paragraphs (11) and (12), respectively.

SEC. 202. Section 201 shall apply only with respect to transfers after the date of the enactment of this title.

Approved June 4, 1963.

Extract  
from FEDERAL REGISTER of July 24, 1963  
Volume 28—Number 143  
DELIVERY OF SILVER BULLION IN EXCHANGE  
FOR SILVER CERTIFICATES

Instructions of the Secretary of the Treasury

Pursuant to the authority of Public Law 88-36 of June 4, 1963, I hereby designate the United States Assay Office at New York City and the United States Assay Office at San Francisco as places where silver bullion may be obtained in exchange for silver certificates. All requests for silver bullion in exchange for silver certificates shall be directed to the Fiscal Assistant Secretary of the Treasury, Washington, D. C., 20220. Such requests may be made through the Federal Reserve Bank of New York, New York City, or the Federal Reserve Bank of San Francisco, San Francisco, California, attention Fiscal Agency Department.

At the time of making such request, silver certificates shall be tendered to the Treasurer of the United States, Washington, D. C., or the Federal Reserve Bank through which the request is made. If the request is made through one of the Federal Reserve Banks specified, other funds may be tendered, in a form satisfactory to the Bank. If funds other than silver certificates are tendered, they shall be accompanied by a request that the Federal Reserve Bank acquire for the account of the person making the tender silver certificates in an equivalent amount and that, upon acquisition of the required amount of silver certificates, they be accepted for the account of the assay office for exchange for silver bullion of equivalent value computed at the mone-

tary value of silver of \$1.292929292 per fine troy ounce. Delivery of the silver bullion shall be effected at the assay office in fine silver bars of approximately 1,000 ounces. The face amount of certificates tendered in exchange must be equal to the monetary value of the silver bullion raised to the next highest dollar.

Where consistent with the public interest, silver bullion shall be delivered at whichever of the designated assay offices is specified by the person requesting silver bullion.

DOUGLAS DILLON  
*Secretary of the Treasury*

July 22, 1963.







